



GEF-6 REQUEST FOR PROJECT ENDORSEMENT/APPROVAL

PROJECT TYPE: Full-sized Project

TYPE OF TRUST FUND: GEF Trust Fund

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PART I: PROJECT INFORMATION

Project Title: Greening the scrap metal value chain through Promotion of BAT/BEP to Reduce U-POPs Releases from Recycling Facilities			
Country(ies):	Thailand	GEF Project ID: ¹	9222
GEF Agency(ies):	UNIDO (select) (select)	GEF Agency Project ID:	150186
Other Executing Partner(s):	Department of Primary Industries and Mines, Ministry of Industry (DPIM-MoI), Pollution Control Department (PCD) and Department of Environmental Quality Promotion (DEQP) under the Ministry of Natural Resources and Environment (MoNRE), Iron and Steel Institute of Thailand (ISIT)	Submission Date:	08/22/2017
GEF Focal Area (s):	Chemicals and Wastes	Project Duration (Months)	60
Integrated Approach Pilot	IAP-Cities <input type="checkbox"/> IAP-Commodities <input type="checkbox"/> IAP-Food Security <input type="checkbox"/>	Corporate Program: SGP <input type="checkbox"/>	
Name of Parent Program	[if applicable]	Agency Fee (\$)	427,500

A. FOCAL AREA STRATEGY FRAMEWORK AND OTHER PROGRAM STRATEGIES²

Focal Area Objectives/Programs	Focal Area Outcomes	Trust Fund	(in \$)	
			GEF Project Financing	Co-financing
(select) CW-1 Program 1 (select)	Develop and demonstrate new tools and regulatory along with economic approaches for managing harmful chemicals and waste in a sound manner Outcome 1.1: Countries have appropriate decision-making tools and economic approaches to promote the removal of barriers preventing the sound management of harmful chemicals and waste	GEFTF	630,000	6,998,773
(select) CW-2 Program 3 (select)	Reduction and elimination of POPs Outcome 3.1: Quantifiable and verifiable tonnes of POPs eliminated or reduced	GEFTF	3,870,000	26,716,013
(select) (select) (select)		(select)		
(select) (select) (select)		(select)		
(select) (select) (select)		(select)		
(select) (select) (select)		(select)		
(select) (select) (select)		(select)		
(select) (select) (select)		(select)		
Total project costs			4,500,000	33,714,786

B. PROJECT DESCRIPTION SUMMARY

¹ Project ID number remains the same as the assigned PIF number.

² When completing Table A, refer to the excerpts on [GEF 6 Results Frameworks for GETF, LDCF and SCCF](#) and [CBIT programming directions](#).

Project Objective: Promote and introduce BAT/BEP measures in scrap metal recycling facilities in order to reduce or eliminate unintentional POPs releases						
Project Components/ Programs	Financing Type³	Project Outcomes	Project Outputs	Trust Fund	(in \$)	
					GEF Project Financing	Confirmed Co- financing
Component 1. Policy and regulatory framework	TA	Outcome 1.1: Policy and regulatory framework strengthened and enhanced for the implementation of a sound management of metal recycling in compliance with the Stockholm Convention requirements.	Output 1.1: A database capturing various aspects of the metal recycling chain, as a new tool for policy makers, compiled. Output 1.2: Specific guidelines on environment, health and safety measures in the metal recycling chain value developed. Output 1.3: Improved and harmonized national policies and regulations for environmental and health protection from metal recovery activities.	GEFTF	275,000	1,460,144
Component 2. Information dissemination and capacity building	TA	Outcome 2.1: Increased awareness on U-POPs and BAT/BEP concepts by relevant stakeholders Outcome 2.2: Improved national capacity in the sound management of the recycling chain of scrap metal.	Output 2.1: Awareness raising materials and awareness raising workshop developed and implemented. Output 2.2: Technicians and operators of the scrap metal sector are trained on BAT/BEP	GEFTF	625,000	5,507,200
Component 3. Pilot project for the demonstration of BAT/BEP in selected metal recycling facilities	Inv	Outcome 3.1 State-of-the-art primary and secondary measures for U-POPs release reduction in selected facilities identified and deployed.	Output 3.1. BAT/BEP measures identified and implemented for scrap collectors and scrap consumers Output 3.2. Training of technical staff and other potentially interested local stakeholders (environmental authority, SMEs, scrap collectors, etc.) in the management of BAT/BEP undertaken	GEFTF	3,150,000	24,247,442

³ Financing type can be either investment or technical assistance.

			Output 3.3. Results of the implemented demonstration projects published and disseminated for replication.			
Component 4. Monitoring and evaluation; knowledge management and dissemination	TA	Outcome 4.1 Effective monitoring and evaluation of project impact and sustainability implemented.	Output 4.1. Project M&E designed and implemented. Output 4.2 Lessons learned disseminated	GEFTF	250,000	1,500,000
	(select)			(select)		
	(select)			(select)		
	(select)			(select)		
	(select)			(select)		
Subtotal					4,300,000	32,714,786
Project Management Cost (PMC) ⁴				(select)	200,000	1,000,000
Total project costs					4,500,000	33,714,786

C. CONFIRMED SOURCES OF CO-FINANCING FOR THE PROJECT BY NAME AND BY TYPE

Please include evidence for co-financing for the project with this form.

Sources of Co-financing	Name of Co-financier	Type of Cofinancing	Amount (\$)
Recipient Government	Department of Primary Industries and Mines, Ministry of Industry	In-kind	2,000,000
Recipient Government	Pollution Control Department (PCD), Ministry of Natural Resources and Environment	In-kind	503,000
Recipient Government	Department of Environment Quality Promotion	Grants	57,144
Recipient Government	Department of Environment Quality Promotion	In-kind	5,578,629
Recipient Government	Iron and Steel Institute of Thailand	In-kind	1,428,571
Private Sector	The Bangkok Iron and Steel Works Co. Ltd	Equity	8,750,000
Private Sector	The Bangkok Iron and Steel Works Co. Ltd	In-kind	4,340,000
Private Sector	NTSC Steel Group Public Co. Ltd	Equity	3,100,000
Private Sector	NTSC Steel Group Public Co. Ltd	In-kind	2,140,000
Private Sector	Thai Metal Aluminum Co., Ltd	Equity	2,133,887
Private Sector	Thai Metal Aluminum Co., Ltd	In-kind	853,555
Private Sector	Daiki Aluminum Industry (Thailand) Co., Ltd	Equity	2,000,000
Private Sector	Daiki Aluminum Industry (Thailand) Co., Ltd	In-kind	610,000

⁴ For GEF Project Financing up to \$2 million, PMC could be up to 10% of the subtotal; above \$2 million, PMC could be up to 5% of the subtotal. PMC should be charged proportionately to focal areas based on focal area project financing amount in Table D below.

GEF Agency	UNIDO	Grants	85,000
GEF Agency	UNIDO	In-kind	135,000
Total Co-financing			33,714,786

D. TRUST FUND RESOURCES REQUESTED BY AGENCY(IES), COUNTRY(IES), FOCAL AREA AND THE PROGRAMMING OF FUNDS

GEF Agency	Trust Fund	Country Name/Global	Focal Area	Programming of Funds	(in \$)		
					GEF Project Financing (a)	Agency Fee ^{a)} (b) ²	Total (c)=a+b
UNIDO	GEF TF	Thailand	Chemicals and Wastes	POPS	4,500,000	427,500	4,927,500
(select)	(select)		(select)	(select as applicable)			0
(select)	(select)		(select)	(select as applicable)			0
(select)	(select)		(select)	(select as applicable)			0
(select)	(select)		(select)	(select as applicable)			0
(select)	(select)		(select)	(select as applicable)			0
(select)	(select)		(select)	(select as applicable)			0
(select)	(select)		(select)	(select as applicable)			0
(select)	(select)		(select)	(select as applicable)			0
(select)	(select)		(select)	(select as applicable)			0
Total Grant Resources					4,500,000	427,500	4,927,500

a) Refer to the Fee Policy for GEF Partner Agencies

E. PROJECT'S TARGET CONTRIBUTIONS TO GLOBAL ENVIRONMENTAL BENEFITS⁵

Provide the expected project targets as appropriate.

Corporate Results	Replenishment Targets	Project Targets
1. Maintain globally significant biodiversity and the ecosystem goods and services that it provides to society	Improved management of landscapes and seascapes covering 300 million hectares	<i>hectares</i>
2. Sustainable land management in production systems (agriculture, rangelands, and forest landscapes)	120 million hectares under sustainable land management	<i>hectares</i>
3. Promotion of collective management of transboundary water systems and implementation of the full range of policy, legal, and institutional reforms and investments contributing to sustainable use and maintenance of ecosystem services	Water-food-ecosystems security and conjunctive management of surface and groundwater in at least 10 freshwater basins;	<i>Number of freshwater basins</i>
	20% of globally over-exploited fisheries (by volume) moved to more sustainable levels	<i>Percent of fisheries, by volume</i>
4. Support to transformational shifts towards a low-emission and resilient development path	750 million tons of CO _{2e} mitigated (include both direct and indirect)	<i>metric tons</i>
5. Increase in phase-out, disposal and reduction of releases of POPs, ODS, mercury and other chemicals of global concern	Disposal of 80,000 tons of POPs (PCB, obsolete pesticides)	<i>Reduction of not less than 23 g TEQ/year of PCDD/Fs released from demonstration facilities</i>
	Reduction of 1000 tons of Mercury	<i>metric tons</i>
	Phase-out of 303.44 tons of ODP (HCFC)	<i>ODP tons</i>
6. Enhance capacity of countries to implement MEAs (multilateral environmental agreements) and mainstream into national and sub-national policy, planning financial and legal frameworks	Development and sectoral planning frameworks integrate measurable targets drawn from the MEAs in at least 10 countries	<i>Number of Countries:</i>
	Functional environmental information systems are established to support decision-making in at least 10 countries	<i>Number of Countries:</i>

F. DOES THE PROJECT INCLUDE A “NON-GRANT” INSTRUMENT? No

(If non-grant instruments are used, provide an indicative calendar of expected reflows to your Agency and to the GEF/LDCF/SCCF/CBIT Trust Fund) in Annex D.

⁵ Update the applicable indicators provided at PIF stage. Progress in programming against these targets for the projects per the *Corporate Results Framework* in the [GEF-6 Programming Directions](#), will be aggregated and reported during mid-term and at the conclusion of the replenishment period.

PART II: PROJECT JUSTIFICATION

A. DESCRIBE ANY CHANGES IN ALIGNMENT WITH THE PROJECT DESIGN WITH THE ORIGINAL PIF⁶

The project structure presented in this document is consistent with that presented in the PIF. The project framework is essentially the same and is based on four components: Component 1 deals with the strengthening the policy and regulatory framework, Component 2 addresses the information dissemination and capacity building activities, Component 3 focuses on the implementation of pilot projects for the demonstration of BAT/BEP in selected metal recycling facilities and Component 4 addresses the monitoring and evaluation issues and the knowledge dissemination. Activities under all project components will be implemented in parallel, to the extent possible.

Due to the detailed assessment made during the PPG phase, however, some changes have been incorporated in the present document compared to the original PIF. A minor redistribution of the budget and rewording of the outputs were made. Output 2.3 of the PIF on the assessment of scrap value chain and identification of the interventions was removed as this was already conducted in the PPG.

A.1. *Project Description*. Elaborate on: 1) the global environmental and/or adaptation problems, root causes and barriers that need to be addressed; 2) the baseline scenario or any associated baseline projects, 3) the proposed alternative scenario, GEF focal area⁷ strategies, with a brief description of expected outcomes and components of the project, 4) [incremental/additional cost reasoning](#) and expected contributions from the baseline, the GEFTF, LDCF, SCCF, CBIT and [co-financing](#); 5) [global environmental benefits](#) (GEFTF) and/or [adaptation benefits](#) (LDCF/SCCF); and 6) innovativeness, sustainability and potential for scaling up.

A.1.1 The global environmental and/or adaptation problems, root causes and barriers that need to be addressed

1. Recycling and reusing valuable material resources is one of the key components for the transition to a low-carbon, resource-efficient green economy. Recycling is beneficial to the environment because it reduces the need to fulfil the demand by exploiting our natural resources further, reduces the waste stream to landfills and prevents the release of toxic substances into the environment. At the same time, recycling also offers social and economic benefits as it generates economic growth by creating business opportunities and new jobs [1].
2. Theoretically, metals can be recycled almost indefinitely and can be returned to the production process without loss of quality, thus providing a valuable opportunity to achieve closure of metal cycles. In addition, metal recycling is an extremely powerful economic activity. This makes that the recycling of metals is an important and well-established economic industrial activity, driven by the value of the recovered metals [2].
3. The metal scrap recycling industry includes the recovery and processing of scrap metal generated from manufacturing scrap (circular scrap from metal works and foundries and left-over material from metal-processing industries) as well as ‘old scrap’ from products and structures after their useful life and temporarily locked up in so-called ‘urban mines’ (Figure 1). The latter is the most common type of scrap.
4. The recycling of scrap metal involves a number of actors in different operations such as collecting, sorting, cutting, pressing, baling, brokering and melting. The supply of scrap usually follows a hierarchical tree that start from scrap metal collectors who pick up small quantities of scrap for sale to scrap yards, which in turn handle and then sell the scrap to the melting installations. The melting facilities, where the scrap metal is melted, refined and transformed into secondary metals, only control a minor part of the scrap chain and the organization of recycling is mainly up to the scrap suppliers.

⁶ For questions A.1 –A.7 in Part II, if there are no changes since PIF, no need to respond, please enter “NA” after the respective question.

⁷ For biodiversity projects, in addition to explaining the project’s consistency with the biodiversity focal area strategy, objectives and programs, please also describe which [Aichi Target\(s\)](#) the project will directly contribute to achieving..

5. Production of secondary metals from scrap through high temperature metallurgical processes has, however, the potential of an enhanced formation and release of unintentionally produced persistent organic pollutants (POPs) and other pollutants of local and global concern (i.e. mercury). POPs constitute a special group of contaminants that pose significant global threats to health and the environment since, by definition, they are highly toxic, bio-accumulate in fatty tissues, persistent in the environment, and are able to travel long distances through the air and through the water reaching even remote areas such as Arctic and Antarctica. Exposure to POPs can lead to reproductive, developmental, behavioural, neurologic, endocrine, and immunologic adverse health effects [3].

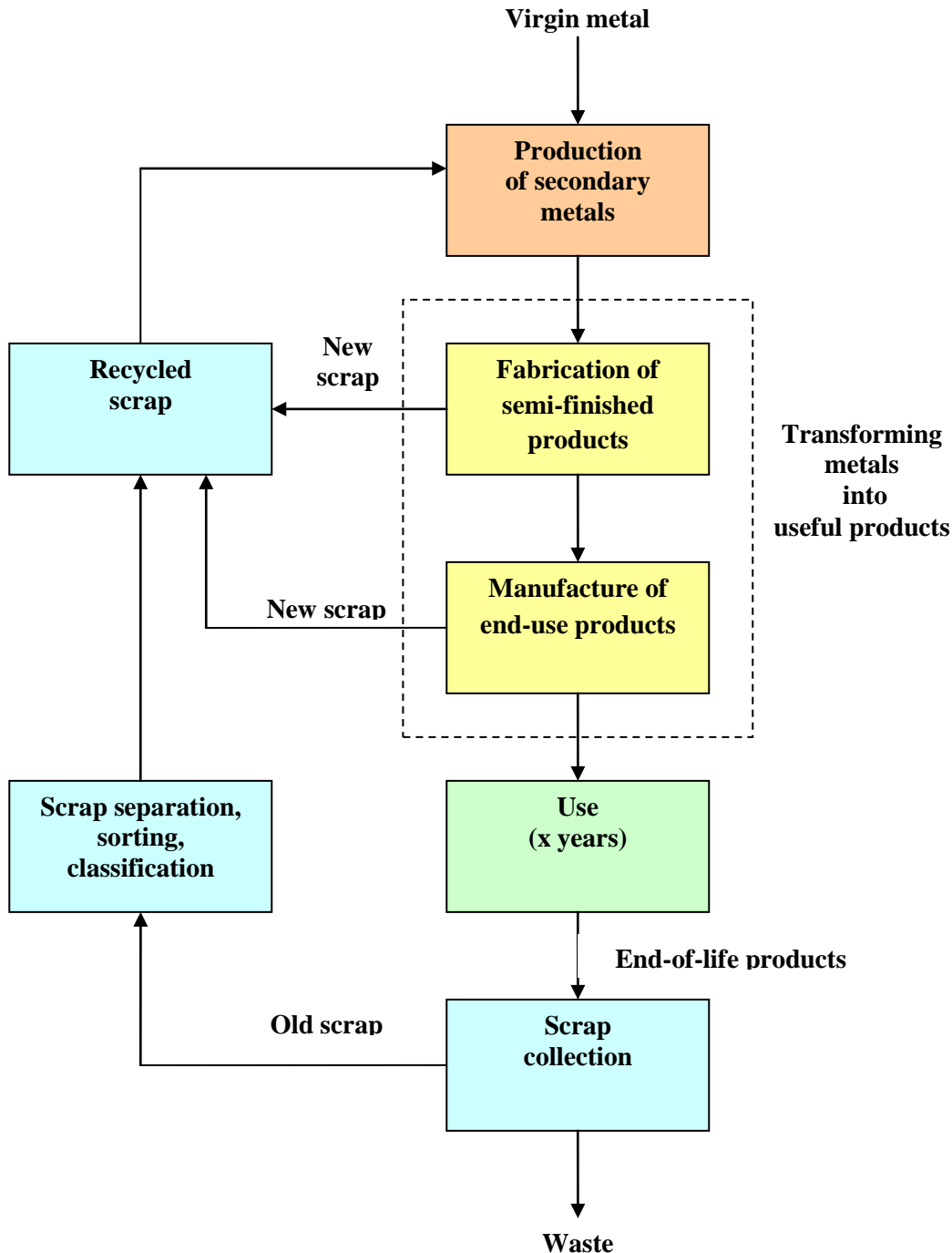


Figure 1. Simplified scheme of the use of metals in society. The recycling of new scrap is a measure to improve efficiency in the manufacturing process. Pre-treatment of new scrap is often minimal. The effort required to go from collected post-consumer products to metal recovery varies widely depending on the metal and the nature of the product.

6. The formation of POPs as unwanted by-products (U-POPs) during pyrometallurgical processes is highly dependent on the raw materials entering the process itself. U-POPs or their precursors may be present in some raw materials or can be formed during incomplete combustion of organic matter such as oils, plastics, paints, lacquers, etc.. In addition, dioxins and furans (PCDD/F) are formed during metals smelting through reaction between oxygen and chlorine compounds on fine carbon particles (produced by incomplete combustion of fuels or organic materials) in the temperature range of 250 to 450 °C. This process is known as de novo synthesis, is catalyzed by the presence of metals such as copper or iron and usually happens in the cooling zone of the flue gas abatement systems and in cooler parts of the furnace, e.g., the feed area [4].
7. The Stockholm Convention on POPs [5] was adopted on 22 May 2001 and entered into force on 17 May 2004 as a global treaty to protect human health and the environment from POP chemicals. Article 5 of the Convention (as amended in 2009 and in 2015) addresses those U-POPs released as unwanted by-products during combustions and industrial processes, which are listed in Part I of Annex C: polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDDs/PCDFs), polychlorinated biphenyls (PCBs), hexachlorobenzene (HCB), pentachlorobenzene (PeCB) and polychlorinated naphthalenes (PCNs).
8. Secondary copper production, sinter plants in the iron and steel industry, secondary aluminum production and secondary zinc production are listed in Part II of Annex C of the Stockholm Convention as source categories with the potential for comparatively high formation and release to the environment of chemicals listed in Part I of Annex C. In addition, the “Guidelines on best available techniques and provisional guidance on best environmental practices” developed by the Expert Group on BAT and BEP and adopted by the Conference of the Parties (COP) at its third meeting, also indicates secondary lead production and secondary steel production as source categories that may be important contributors to the release of PCDDs/PCDFs (Annex C, Part III, b-Thermal processes in the metallurgical industry not mentioned in Part II). Furthermore, ferrous and non-ferrous metals production are also significant sources of other pollutants, such as particulate matter, organic compounds such as VOCs and PAHs, heavy metals and mercury, impacting on the worker’s health and the global environment.
9. Under the Stockholm Convention, Parties should take measures to reduce the total releases derived from anthropogenic sources of such chemicals, with the goal of their continuing minimization and, where feasible, ultimate elimination. For this purpose, Parties shall promote in some cases and require in others the use of Best Available Techniques (BAT), and promote the application of Best Environmental Practices (BEP) for source categories listed in Parts II and III of Annex C.
10. One of the innovative aspects of the SC is that it seeks to reduce “the total releases derived from anthropogenic sources of each of the chemicals listed in Annex C”. In other words, releases of U-POPs into the five compartments and/or media into which U-POPs can be released or transferred, air, water, land, residues, and products, must be considered. For this, the requirements of the SC are different from those of other legally binding instruments such as the United Nations Economic Commission for Europe (UNECE) Protocol on POPs developed under the Convention on Long-range Transboundary Air Pollution (LRTAP) [6]. This agreement was adopted in 1998 and entered in force on October 2003. The ultimate objective of the UNECE Protocol on POPs is “to control, reduce or eliminate discharges, emissions and losses” of POPs, but it primarily focuses on atmospheric releases.
11. From the point of view of the SC, the only long-term solution to reduce the level of POPs in the environment is to prevent these substances from being released. Whilst little can be done for pollutants released in the past, much can be done to reduce the current and future releases of POPs. The U-POPs flow is characterised by relatively small amounts that are constantly formed and released, remarkable stocks that need to be disposed of do not exist. The crucial point in reducing future loading of U-POPs in the environment is to reduce their formation and releases by applying BAT and BEP so that the global efforts to reduce the environmental and human exposure to POPs is not undermined by global warming. The approaches that prevent the formation and release of chemicals listed in Annex C should have higher priority, as outlined in section A of Part V of Annex C. In fact, the prevention of their

formation, or their total destruction after formation, is the only way to ensure the minimization or virtually elimination of releases of U-POPs to all media. Secondary (end-of-pipe) measures which are used to remove U-POPs from stack gases (scrubbers, fabric filters, electrostatic precipitators, adsorption on activated carbon, etc.) might not be the best choice for reducing U-POPs releases because they do not eliminate the generation of U-POPs and do not destroy previously formed U-POPs but simply transfer them from a medium (air) to another (filter dust or sludge). To fully comply with the requirements of the SC, technologies and techniques capable of destroying or preventing the formation of U-POPs should be favoured, in order to minimize or virtually eliminate releases of U-POPs to all media.

12. In the secondary metallurgical industry, U-POPs are mainly formed and released into the environment during the melting process. However, the extent of this formation is closely linked to the quality of the scrap introduced into the melting furnace. It is, therefore, evident that a systemic solution to the problem of the release of U-POPs from the thermal processes in the metallurgical industry can not overlook the entire value chain of scrap metal and the implementation of a mechanism for their sustainable management. Sustainable scrap metals management requires an efficient end-of-life collection of products, an effective sorting and treatment after collection, the implementation of best practices of physical separation, the implementation of the best metallurgical technologies and, lastly, the adoption of suitable secondary (end-of-pipe) measures as a means to contain or reduce emissions.
13. In most countries, including Thailand, the metallurgical sector still has very limited technical knowledge on the U-POPs issues and related BAT/BEP. Several factors act as barriers for a wide implementation of BAT/BEP in the metals producing industry. Among these we can indicate: (i) insufficient stakeholder awareness on health and environmental pollution and, in particular, on the local and global hazard posed by U-POPs; (ii) lack of information/technical knowledge on best practice and technologies; (iii) absence of a knowledge network for the exchange of technical know-how and dissemination of information on environmental management systems; (iv) lack of effective training systems to provide qualified human resources for BAT/BEP evaluation and selection; (v) lack of first mover companies and first example facilities; (vi) lack of external pressure from authorities, environmental organizations or the general public. Awareness on the environmental issues among scrap metal recyclers is substantially absent. Information and statistics on the availability of different types and categories of scrap, recycling capacities, technology status etc. are usually not available. The growing markets on this sector and accompanying economic development have further added to the complexity of instituting a robust baseline on scrap recycling value chain.

A.1.2 The baseline scenario or any associated baseline projects

A.1.2.1 Overview of the metallurgical industry in Thailand.

14. A detailed report on the metallurgical industry of Thailand (**Annex G**) was done by the Iron and Steel Institute of Thailand. Thailand is the twenty-first largest economy in the world and the second largest economy in Southeast Asia (GDP-PPP \$1.1 trillion in 2015) [7]. However, its GDP-PPP per capita ranks only 101 in the world (\$16,100). Thailand historically has had a strong economy, growing at an average annual rate of 7.5 percent in the boom years of 1986 to 1996 and 5 percent following the Asian crisis during 1999-2005. Average growth has slowed to 3.5 percent over 2005-2015 [8]. Looking ahead, the World Bank forecasts growth of 2.9 to 3.3 percent for 2016-2018.
15. The rapid economic and social growth of Thailand was supported by a rapid acceleration in the development of infrastructure facilities such as water, electricity, and transportation facilities, in the advancement of the manufacturing industry and in the export of technology-based manufactured products. Recently, the Government launched an infrastructure investment programme, aimed at modernising the country's land transport and logistics systems, as part of an investment plan running until 2020 [9].
16. Being an emerging economy as well as a newly-industrialized country, Thailand needs to produce and consume large amount of steel and non-ferrous metals. In 2015, Thailand produced 3.7 million tonnes of crude steel (36th

largest global producer) [10]. The steel produced in Thailand is largely insufficient to meet the needs of the country's development. In 2015, the apparent use of finished steel was 16.73 million tons (apparent steel use per capita: 246.2 kg of finished steel products). The shortfall was balanced by the import of 14.63 million tonnes of semi-finished and finished steel products, mainly from Japan, China, Republic of Korea, Taipei and Russian Federation (Figure 2) [11].

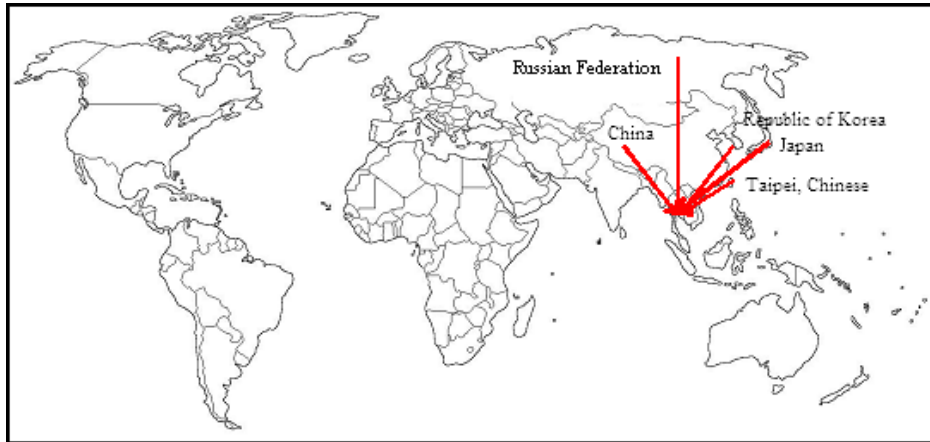


Figure 2. Supplying markets of iron and steel products to Thailand in 2015. First five countries: Japan (value: US\$ 3.84 billion), China (value: US\$ 2.08 billion), Republic of Korea (value: US\$ 1.33 billion), Taipei (value: US\$ 0.55 billion), Russian Federation (value: US\$ 0.24 billion). Total value of imported iron and steel products: US\$ 9.59 billion. Source: International Trade Center, <http://www.intracen.org/itc/trade-support>.

17. Considering an annual steel consumption of 400-500 kg per capita to be a fair level of economic development, the per capita steel consumption in Thailand is below that of developed countries. Thus, sustained growth in steel consumption can be expected to continue in the future, supported by ongoing and new public construction projects and the demand of high-quality steel in the automotive industry, a major driver of the Thai economy.
18. Thailand does not have an integrated iron & steel industry and all the steel produced in the country comes from the recycling of ferrous scrap in electric furnaces. Steel production from secondary resources will grow even more in the future if the steel production capacity in Thailand will be expanded to reduce its high import dependency. Currently, the Thai steel industry structure is composed of 23 mini-mills (21 billet producers and 2 slab producers) with a nominal total production capacity of about 10.4 million tons of crude steel per year. In the long steel segment, the industry is based on about 50 hot-rolling mills and about 100 cold-drawing mills. As for flat steel, production is performed in 5 hot-rolling mills, 3 cold-rolling mills and 15 coating mills. The industry is completed with more than 1000 forming mills (machining, bending, cutting, welding, forging, heat treatments, etc. [12]. Moreover, there are about 90 manufacturers in the cast iron industry (iron cast for the automotive and machinery industries), with a production capacity of 1.0 million ton/year. These manufacturers are important scrap users, too. The location of the mini-mills and of the rolling mills is reported in Figure 3. The number of manufacturers and production capacity of the steelmaking industry and cast iron industry in Thailand is reported in Table 1.

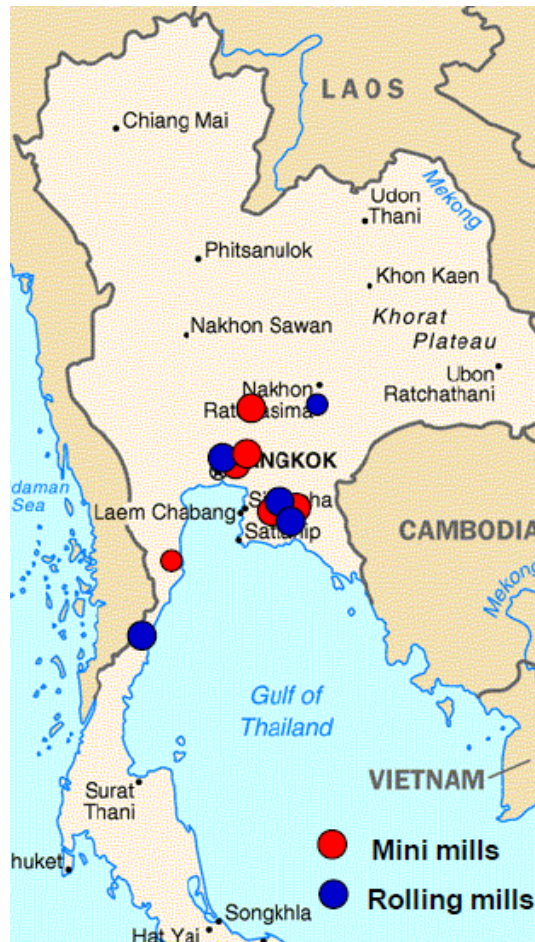


Figure 3. Location of the mini-mills and of the rolling mills in Thailand. Source: Iron and Steel Institute of Thailand.

Table 1: Number of manufacturers and production capacity of the steelmaking industry and cast iron industry in Thailand.

Industry	Product	Furnace type*	Number of manufacturers	Production capacity (million ton/year)
Steelmaking industry	Slab	EAF	2	3
	Billet	EAF	15	6.16
	Billet	IF	6	1.27
Total			23	10.43
Cast iron industry	Cast iron products	IF & Cupola furnace	90	1.00
Total			90	1.00
Grand total			113	11.43

* EAF: Electric Arc Furnace; IF: Induction Furnace.
Source: Iron and Steel Institute of Thailand

19. According to the South East Asia Iron and Steel Institute (SEAISI) Statistics, in 2015, Thailand was the second largest scrap steel consumer in Southeast Asia (Indonesia is the largest), with a total consumption of 3.9 million tonnes. Domestic supply accounted for 3.4 million tonnes. In Thailand there are 5 large, 6 medium and 92 small

domestic scrap traders which collect metal scrap to directly supply steel producers. International traders collect scrap steel for import-export. In Thailand, there are currently 121 scrap importers and 183 scrap exporters. Total import of steel scrap in 2016 was 953,066 tonnes, with only 434,700 tonnes consumed in steel production. Major sources were USA, Australia, New Zealand, Japan and Philippines, (Figure 4). Export volume was quite significant, at 431,162 tonnes (value US\$ 177.2 million, 6.3 billion baht). Thailand exported scrap to various countries and major destinations were India, Indonesia, Bangladesh, Japan, China, South Korea and Laos [11].



Figure 4. Supplying markets of steel scrap to Thailand in 2016. First five countries: USA (315,756 tons, value: US\$ 80.4 million), Australia (138,358 tons, value: US\$ 34.5 million), New Zealand (56,144 tons, value: US\$ 13.8 million), Japan (55,514 tons, value: US\$ 16.2 million), Philippines (46,417 tons, value: US\$ 9.6 million). Total value of imported steel scrap: US\$ 245.8 million. Source: International Trade Center, <http://www.intracen.org/itc/trade-support>.

20. SEAISI reported that the construction sector was the largest consumer of steel in 2015, accounting for 59.7% of total steel consumption, followed by the automotive sector (19.0%) and the machinery&industry (6.6%). Steel demand in the construction sector in Thailand is significantly lower than other ASEAN countries such as the Philippines and Vietnam (85 and 93%, respectively) because Thailand has strong manufacturing sectors, such as automotive, electrical appliances, machinery and equipment etc. As a consequence, the use of flat steel dominates, accounting for 63% of total steel used while the share of long steel demand, mainly used in the construction sector, was 37% [13].
21. The second largest steel consuming sector is the automotive sector. Here decision making for selecting steel materials is made by end users. Car makers have strong influence on selecting steel materials and two major concerns are material quality and price. National steel producers have difficulties in meeting the stringent specifications set by the foreign owned automotive companies. This, coupled with the observation that overall supply chain in Thai steel industry basically starts from processing steel, there is a need to import steel from qualified sources in other countries to serve the high end and middle end steel products. Overall, there is the need for new sources from local steel producers to enhance self-sufficiency in domestic supply for high-quality steel in the coming years to serve its growing demand and to substitute import.
22. Thailand does not produce primary aluminum due to the lack of bauxite deposits. Moreover, the import and processing of bauxite is not favoured because of the high electrical energy requirements in the production of primary aluminum. Therefore, the aluminum industry in Thailand mainly uses imported unwrought aluminum and recycled aluminum scrap. In 2016, Thailand imported 631,603 tonnes of unwrought aluminum, mainly from the United Arab Emirates, Australia, South Africa, Malaysia and Qatar (Figure 5). In the same year, Thailand exported 56,198 tonnes of unwrought aluminum (value: US\$ 101.8 million) and major destination were India, Japan, Viet Nam, Indonesia and Cambodia. Beside unwrought aluminum, Thailand also imported (and exported) semifinished and finished aluminum products (import value: US\$ 1.33 billion; export value: 1.34 billion) [11].



Figure 5. Supplying markets of unwrought aluminum to Thailand in 2016. First five countries: United Arab Emirates (135,790 tons, value: US\$ 248.3 million), Australia (129,014 tons, value: US\$ 227.5 million), South Africa (60,680 tons, value: US\$ 108.5 million), Malaysia (57,888 tons, value: US\$ 105 million), Qatar (46,193 tons, value: US\$ 84.9 million). Total value of imported unwrought aluminum: US\$ 1.13 billion. Source: International Trade Center, <http://www.intracen.org/itc/trade-support>.

23. The information gathered during the PPG phase has identified 54 major factories that can be divided into 6 groups:

- Aluminum smelting industry
- Aluminum casting industry
- Aluminum profile industry
- Aluminum sheet and foil industry
- Aluminum packaging industry
- Aluminum cable industry.

24. Factories in the aluminum smelting industry can be divided into two subgroups: producers of aluminum ingots that sell their product to downstream factories and manufacturers of aluminum cast products that recycle their scrap inside the factory in melting furnaces. In Thailand there are 11 major aluminum ingot manufacturers with a total production capacity of about 450,000 tons per year. The top three players in this industry group have a combined market share of 63.34% of the entire sector. More than 80% of secondary aluminum ingots is supplied to intermediate manufacturers of aluminum products.

25. Thailand, apart from using its indigenously generated aluminum scrap, is a major scrap importers. In 2016, Thailand imported 77,464 tonnes of aluminum scrap, valued at app. US\$ 97.34 million, with Cambodia, Germany, England, Australia, and Taiwan among the top five sources. In the same year, Thailand exported 77,560 tonnes of aluminum scrap valued at approx. US\$ 95.62, to South Korea, Greece, the United States, India, Japan and other countries [11]. According to the Ministry of Commerce data, 64 importers and 86 exporters of aluminum scrap are operating in Thailand.

26. The aluminum industry in the country continues to grow continually as a result of high consumption demand of related industries such as the automotive industry, construction industry, packaging industry, and electrical appliance industry. The total demand for aluminum in Thailand in 2016 was 1,181,688 tonnes. The automotive

sector is a major driver of the Thai economy, accounting for approximately 12% of the Thai GDP, employing more than 550,000 people and with most of the world's vehicles and auto-parts brands and manufacturers present in the country [14]. In 2015, the production of cars in Thailand was 1.9 million cars with 800,000 cars sold domestically and 1.2 million cars exported. On average, each modern car use approximately 140 kg of aluminum. Therefore, as much as 260,000 tonnes of aluminum in Thailand ended up in automotive parts (about 20% of the total demand for aluminum in Thailand).

27. Production of secondary aluminum from both post-consumer scrap (discarded aluminum products) and new (manufacturing) scrap is expected to increase in Thailand in the coming years to support the ongoing industrialization process and the economic growth and to substitute import of unwrought aluminum. The economic incentives for recycling aluminum are currently more important than environmental considerations. In Thailand, secondary aluminum producers still need to implement production techniques to enhance performance and reduce environmental impacts.



Figure 6: Photo of scrap metals for processing

A.1.2.2 Dioxin inventory

28. The most recent PCDD/Fs emission inventory for Thailand has been carried out in 2005. Potential national releases of PCDD/Fs emission to air, water, land, product and residue were estimated at 1075.88 g TEQ/year as reported in the National Implementation Plan (NIP) [15]. The total release from the ferrous and non-ferrous metal production was estimated at 119.7 g TEQ/year, accounting for 11.14% of the total national release. The currently available information on PCDD/Fs releases from ferrous and non-ferrous metal production is summarized in the Table below.

Table 2: Annual releases of PCDD/Fs in Thailand from source category 2 – Ferrous and non-ferrous metal production (Base year: 2004)

	Production (ton/year)	Annual releases of PCDD/Fs (g TEQ/year)		
		Air	Residues	Total
Iron and steel production	6,583,739	19.773	98.756	118.529
Iron and steel foundries	3,562	0.0025	0.021	0.0235
Secondary copper production	1,200	0.060	0.756	0.816
Secondary aluminum production	258	0.009	0.103	0.112
Secondary lead production	24,072	0.193	ND	0.193
Brass and bronze production	500	0.0005	ND	0.0005

Total for source category 2		20.04	99.66	119.7
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Source: Technical Report. Establishment of POPs inventories and assessment of infrastructure and capacity. NIP/POPs Coordination Office. July 2005.

29. According to available data, secondary steel production in electric arc furnaces represents almost all of PCDD/Fs releases from source category 2 – ferrous and non-ferrous metals production. However, data in the dioxin emission inventory reported in the NIP are highly incomplete with regard to non-ferrous metals production. For example, activity rate of secondary aluminum production is reported at only 258 tonnes/year, while the total capacity of ingot manufactures is rated at about 500,000 tonnes/year. In addition, many small recycling shops that produce and sell quite large amounts of secondary non-ferrous metals are active in Thailand but the actual activity rate is unknown. This might be a relevant source of PCDD/Fs releases.

A.1.2.3 Baseline situation and associated baseline projects

Component 1. Policy and regulatory framework

30. Thailand has developed its 20-year national strategic plan which will help the country to achieve sustainable development known as the "6-6-4 plan". The plan consists of six areas, six primary strategies, and four supporting strategies. The six areas include (1) security, (2) competitiveness enhancement, (3) human resource development, (4) social equality, (5) green growth, and (6) rebalancing and public-sector development. The six primary strategies seek to enhance and develop the potential of human capital; ensure justice and reduce social disparities; strengthen the economy and enhance competitiveness on a sustainable basis; promote green growth for sustainable development; bring about national stability for national development toward prosperity and sustainability; and enhance the efficiency of public sector management and promote good governance. The National Economic and Social Development Plan would be formulated in line with this national strategy. In addition, Thailand is entering the fourth industrial revolution by deploying "Thailand 4.0" policy to reform Thailand's existing and new industries include automotive, electronics, robotics, aviation and logistics, etc. This policy framework is strongly relevant with with the objectives of the project.
31. Thailand has a complex network of laws and regulations which protect the environment. The most important act, the Enhancement and Conservation of the National Environmental Quality Act B.E. 2535 (1992), aimed to mitigate environmental stresses which have been continuously occurring since the 1980s. The Act indicates the roles of the Thailand Pollution Control Department (PCD) of the Ministry of Natural Resources and Environment (MONRE). This role include the individuation of pollution control areas, the establishment of pollution control standards, the categorization of pollution control sources (releases to air, water and waste disposal) the coordination of remediation to pollution problems and also the prescription of possible pollution prevention measures. In order to control the emissions of pollutants into the atmosphere from industries, MONRE of Thailand in 2006 identified several substances to be controlled in industrial emissions: particulate matter, sulphur dioxide, nitrogen oxides, carbon monoxide, hydrogen sulphide, hydrogen chloride, sulphuric acid, xylene, cresol, antimony, arsenic, copper, lead and mercury. Unfortunately, dioxins and furans are not the list.
32. The Ministry of Industry established guidelines for its 20 Year Master Plan of Thailand's Future Industrial Development during 2010-2029. The vision is to attain innovative, well-balanced, and sustainable industries, which are divided into 3 phases: Knowledge-based industry (2010-2014), Innovative Industry (2010-2019) and Sustainable Industry (2010-2029).
33. Minerals-related activities in Thailand are administered mainly by the Mineral Act B.E. 2560 (2017), which consolidates the Mineral Act, B.E. 2510 (1967), last amended in 2002 (the MA), and the Mineral Royalty Rates Act, B.E. 2509 (1966), last amended in 1979 (the MRA), into one piece of legislation. The Mineral Act specifies rights and responsibilities of the governmental agencies and the miners, as well as terms and conditions for permit issuance, operations, and termination. Mineral processing and metallurgical processing also require permits for operation. In case of mining, mineral processing and metallurgical processing, further laws have to be considered. The Enhancement and Conservation of the National Environmental Quality Act B.E. 2535 (1992) or NEQA

specifies that mining, quarrying and some metallurgical processing activities must conduct an environmental impact assessment (EIA) during the license application process. During the operation, mineral-related operators such as metallurgical processing must conform to the regulations and the conditions attached to the licenses. They mainly cover the subjects of rights and responsibilities, operating plan, technical matters, safety and impact prevention. The Department of Primary Industries and Mines, Ministry of Industry, is the principal governmental body responsible for overseeing mining, mineral processing, metallurgical processing and mineral trade activities.

34. A schematic representation of the network of laws and regulations in Thailand impacting on the industry and the environment at the national and local levels is reported in the Table below.

Table 3: Laws and regulations in Thailand impacting the environment

Regulation	Provisional Constitution of Thailand B.E. 2557 (2014)	National Economic and Social Development Act B.E. 2521 (1978)	Factory Act B.E. 2535 (1992)	Mineral Act B.E. 2560 (2017)	Enhancement and Conservation of the National Environmental Quality Act B.E. 2535 (1992)
National Policy	20-year National Development Scheme Present Government Policy as announced in August 2014 by General Prayuth Chan-o-cha, Prime Minister of Thailand Thailand 4.0	The 12 th National Economic and Social Development Plan (2017-2021)	Green Industry Mark (GIM) Policy Industrial Eco Town Industrial Waste Management Plan (2015-2019)		20-year Policy Perspective National Environmental Quality Management Plan (2017-2021)
Ministerial Plan		Ministerial / Department (20-year Strategic Plan and 5-year Action Plan)		Ministry of Industry Strategic Plan (2017 – 2021)	Regional Environmental Quality Management Plan
Provincial Level		Provincial and Cluster Development Plan			Action Plan for Natural Resources and Environmental Management
Local Level		Local Development Plan and Community Development Plan			

35. Thailand also recognizes the challenges facing global community and therefore, has become a party to many conventions such as the United Nations Framework Convention on Climate Change (UNFCCC), the Convention

of Biological Diversity (CBD), the Stockholm Convention on Persistent Organic Pollutants (SC), the United Nations Convention to Combat Desertification (UNCCD) in order to cooperate with global community to address these challenges.

36. Thailand signed the Stockholm Convention on 22 May 2002 and ratified it on 31 January 2005. As a party of the Stockholm Convention on POPs, Thailand has developed a National Implementation Plan (NIP) in 2007. The NIP provides policy and strategy frameworks as well as action plans and activities to meet objectives specific to Thailand. A second NIP covering the period from 2015 to 2019 is under development.
37. In accordance with national policies on natural resources and environment, issues and activities foreseen for Thailand are the management of new industrial POPs and POPs in products by using tools such as green industry, eco-factory concept, waste exchange and industry-urban symbiosis, the use of clean technology, development of alternatives to POPs and disposal of POPs, the application of best available techniques (BAT) and best environmental practices (BEP) to reduce or eliminate the unintentional release of POPs from sources and the synergy of chemicals and waste conventions and synergy with climate change.
38. Currently, five sectors are regulated in terms of U-POPs releases in Thailand. They include municipal waste incinerators, kilns that burns waste or hazardous residues from the industry, medical waste incinerators, industrial plants that use processed used-oil or synthetic fuels, and cement plants. However, no regulatory standards has been issued specific to U-POPs for the ferrous and non-ferrous metal production industry. It is envisaged that the project will contribute to the development of the regulatory standards on U-POPs for the ferrous and non-ferrous sectors.

Table 4: U-POPs laws and regulations implemented in Thailand

Ministerial notification	Government Royal Gazette	Year	Subject	Sources	Max. Value of PCDDs/PCDFs (ng I-TEQ/Nm ³)
Industry	Volume 119 Special section 106 Ngor Page 47	30 October 2002	Emission Standard for Incinerators for industrial hazardous wastes or unused materials	Industrial hazardous wastes or unused materials	0.5
Natural Resources and Environment	Volume 120 Special section 147 Ngor Page 5	25 December 2003	Emission Standard for Infected waste incinerator	Infected waste incinerator	0.5
Industry	Volume 122 Special section 52 Ngor Page 8	14 July 2005	Emission Standard for Industrial Furnace Using Processed Used-oil and Synthetic Fuel	Industrial Furnace Using Processed Used-oil and Synthetic Fuel	0.5
Natural Resources and Environment	Volume 123 Special section 129Ngor Page 9	15 December 2006	Emission Standards for Cement Plant Using Wastes as Fuel or Raw Materials	Cement Plant Using Wastes as Fuel or Raw Materials - Existing Plants - New Plants	0.5 0.5
Natural Resources And Environment	Volume 127 Special section 87 Ngor Page 34	16 July 2010	Emission Standard for Municipal Waste Incinerators	Municipal Waste Incinerators - with 1-50 tonnes/day capacity	0.5

				- with more than 50 tonnes/day capacity	0.5
				Existing Waste Incinerators and New Waste Incinerators (having operation permit or specific expansion after July 16, 2010)	
				- with 1-50 tonnes/day capacity	0.5
				- with more than 50 tonnes/day capacity	0.1

39. The Department of Primary Industries and Mines (DPIM) under the Ministry of Industry is the main governmental office that controls and supervise industry practices according to the Minerals Act of Thailand. While several initiatives on this issue has been undertaken by the Department, there is currently no policy (only a guideline) on scrap metal recycling and the secondary metals industry. The guideline focuses on scrap metal recycling and the secondary metals industry but has no reference U-POPs formation and releases and the associated measure for their reduction (BAT/BEP). The Government recognizes the need to fill the gap between the national legal framework and the Stockholm Convention mandates by further strengthening and harmonizing its existing regulatory frameworks. The project aims to address this gap.

Component 2. Information dissemination and capacity building

40. Some information dissemination activities have been performed in the past by the Government of Thailand. PCD assists industry in improving environmental compliance and reducing pollution by holding training and technology workshops and publishing manuals on best practices for pollution control. PCD also builds human resource capacity through the Thailand Air Pollution Center for Excellence (TAPCE). Information on the Stockholm Convention is available under the PCD website. However, awareness on U-POPs issues is still very limited in the country and the knowledge management system on BAT/BEP still need to be adequately addressed.

41. Raising awareness and capacity building on productivity and efficiency improvement in the metallurgical sector is one of the major roles of DPIM. It has been promoting recycling technology research and usage of metal scrap as replacement of natural raw materials. The department has also, so far, initiated the following activities related to scrap metals: The Classification of Thailand Steel Scrap Project, phase I, 2001-2008; The Classification of Thailand Steel Scrap Project, phase II, 2009-2010; The Best Practice of Efficiency Improvement in Steel Processing Project (related with steel scrap classification) 2011; The Efficiency Improvement for Mineral Dressing and Steel Processing Project, 2012-2013. Based on these activities, DPIM prepared a "Guidance to determine the scrap specification B.E. 2553 (2010)" for classifying ferrous scrap into 10 major categories: 1) Plate & Structural steel (P & S), 2) Heavy Melting scrap (HMS), 3) Process scrap, 4) Bundle scrap, 5) Shredded scrap, 6) Cast iron scrap, 7) Turning & Boring, 8) Light scrap, 9) Mixed scrap, and 10) Steel can scrap. Recently, DPIM has done some research about metal recycling, including recovery of precious metals from industrial waste and e-scrap (electronic devices, PCB, CPU, etc.). These baseline projects needs to be integrated and expanded to include information and knowledge on issues of POPs and concepts of BAT and BEP. Coordination with the Pollution Control Department

of the Ministry of Environment which is mandated to conduct awareness raising activities on POPs is important to ensure that relevant sectors are informed of these issues.

42. During discussions with stakeholders during the PPG, it was evident that the metallurgical sector in Thailand still has very limited technical knowledge on the U-POPs issues and related BAT/BEP. Most technical personnel in the industry acknowledge that there is no formal channel for disseminating complete and unbiased information on techno-economic parameters of new technologies. Awareness on the environmental issues among scrap metal recyclers is substantially absent. Awareness on gender mainstreaming in the scrap metal management activities is absent, too. Component 2 of the project aims to disseminate basic information on the issues of U-POPs and concepts of BAT/BEP in the sector. Similarly, strengthening of technical expertise of operators and technicians through in-plant training is envisaged.

Component 3. Pilot project for the demonstration of BAT/BEP in selected metal recycling facilities

43. Currently, the secondary metallurgical industry in Thailand is an important source of U-POPs releases. According to the national U-POPs inventory (base year: 2004), carried out applying the UNEP Dioxin Toolkit [16] and developed as part of the Thailand's National Implementation Plan of the Stockholm Convention, the iron and steel industry released 118.5 g-TEQ of PCDD/PCDF, accounting for 11.0% of the estimated total national release. Minor amounts of PCDD/PCDF are released from others source categories (iron and steel foundries, secondary copper production, secondary aluminum production, secondary lead production, brass and bronze production) totaling a further release of 1.145 g-TEQ to be added to the releases from the group source of ferrous and non-ferrous metal production (total release 119.7 g-TEQ/year or 11.14% of the national total release).
44. Measurements performed during the Thailand dioxin sampling and analysis program performed in 2001 gave PCDD/Fs stack emission concentrations of 0.32 to 0.61 ng I-TEQ/m³ (average 0.50 ng I-TEQ/m³) from a secondary steel plant and stack concentrations of 0.13 to 0.21 ng I-TEQ/m³ (average 0.15 ng I-TEQ/m³) from a secondary brass smelter [17]. In 2009, the Pollution Control Department (PCD) conducted analysis of PCDD/Fs emission in the steel sector. They found that the emissions of PCDD/Fs from a steel producer using the electric arc furnace (EAF) was around 0.52 ng I-TEQ/m³, which is higher than the international standard (0.1 ng I-TEQ/m³).
45. There is a strong consensus that inventory figures provided in the 2007 NIP should be revised and updated. Data in the dioxin emission inventory are highly incomplete with regards to non-ferrous metals production mainly because of the difficulties in collecting baseline and production data for potential emission sources. Many small recycling shops that produce and sell quite large amount of secondary non-ferrous metals were active in Thailand but the actual activity rate was unknown at the time of the development of the dioxin inventory. These factories are still in operation and might be a relevant source of PCDD/PCDF releases. Moreover, the choice of the more appropriate emission factors to be used in the development of the dioxin inventories was complicated by a lack of expertise in the technology sector and in BAT/BEP.
46. The implementation of BAT/BEP in the scrap metal value chain is a completely new issue in Thailand. Although the domestic industry continues to improve its processes to enhance its economic performance, it does not pay much attention to the local and global hazard posed by U-POPs, because of the lack of awareness on health and environmental risks, lack of information/technical knowledge on best practice and technologies, lack of first mover companies and lack of external pressure from authorities, environmental organizations or the general public.
47. The private sectors involved in the project have committed significant investment to enhance energy, material and process efficiencies. However, these initiatives can not be considered the result of a holistic approach to improve environmental, economic and social performances and do not guarantee the achievement of the goal of reducing emissions of U-POPs and the related global environmental benefits. Therefore, there is a need to ensure that the technologies purchased are compliant with the Stockholm Convention's requirements and that facilities are

upgraded to a BAT level. There is also a need to strengthen the capacities of the national metallurgical industry in the identification, implementation and management of BAT and BEP for the secondary metals industry. It is expected that the innovations implemented at the demonstration facilities and replicated nationwide will dramatically reduce releases of U-POPs and other pollutants of local and global concern and will reduce energy consumption allowing a more sustainable use of natural resources.

48. The growth in the production of ferrous and non-ferrous metals is expected to continue over the next years due to the continued growth in domestic demand. Recycling of scrap metals appears to be rapidly expanding in Thailand for economic and environmental reasons, following the same trend that emerged in industrialized countries. The expected increase in the amount of produced ferrous and non-ferrous metals will represent an increase in the environmental releases of chemicals that pose significant global threats to health and the environment such as U-POPs and other pollutants of concern.
49. Taking into account the magnitude of the U-POPs problem and given the absence of appropriate countermeasures, the releases to the environment of U-POPs and other pollutants of concerns from the secondary metallurgical industry is expected to increase substantially in the future. As a consequence of the expected increase of secondary metals production, the Government of Thailand places priority to the implementation of BAT and BEP measures to reduce U-POPs releases from the national metallurgical industry in order to reduce possible negative effects on human health and the environment at national, regional and global scale.

A.1.3 The proposed alternative scenario, GEF focal area strategies, with a brief description of expected outcomes and components of the project

50. The project is consistent with the GEF6 strategy on Chemicals and Waste 1 and 2 - CW-1: Develop the enabling conditions, tools and environment to manage harmful chemicals and wastes and CW-2: Reduce the prevalence of harmful chemicals and waste and support the implementation of clean alternative technologies/substances. Specifically, it is consistent with CW-1 Program 1: Develop and demonstrate new tools and regulations, along with economic, approaches for managing harmful chemicals and waste in a sound manner and CW-2 Program 3: Reduction and elimination of POPs. The project supports the implementation of appropriate decision-making tools and regulatory approaches to promote the removal of barriers for the nationwide diffusion of BAT and BEP the demonstration of techniques and practices for the reduction of emissions of unintentional POPs (Article 5 of the Stockholm Convention).
51. The overall objective of the proposed GEF-funded project is to protect human health and the global environment from U-POPs produced by thermal processes in the metallurgical industry and that originate from the unsound recycling of scrap metals. Therefore, the proposed project intends to support the Government of Thailand with the necessary technical and financial assistance in order to meet its obligation under Article 5 of the Stockholm Convention and implement its priority actions indicated in the NIP.
52. The project aims to address and remove many of the technical and institutional barriers that until now have hindered the spread of environmentally sustainable approaches for a sound management of the recycling of scrap metal along the entire value chain. In line with this objective, the project aims to strengthen the institutional capacity (decision makers and private sector), to improve the legislative and regulatory framework, and to identify, implement and demonstrate, at selected demonstration sites, state-of-the art techniques which could be applied along the entire scrap metal value chain (collection, treatment, end-use) for reducing U-POPs formation and releases from the secondary metals production processes. The project will address these problems through an integrated approach that combines awareness raising, capacity building, technical assistance and investment.

A.1.3.1 Proposed alternative scenario

53. The proposed project will be developed through four linked components that will be implemented to achieve the expected results: Component 1 is designed to improve and strengthen the policy and regulatory framework in order to fill the gaps between the national legal framework and the Stockholm Convention requirements and effectively ensure the sustainability and replicability of the outcomes of the project; Component 2 supports the strengthening of the technical capacity and skills of human resources in order to develop the necessary expertise for a wide diffusion of international technologies/techniques for a sustainable management of the scrap metal value chain; Component 3 provides for the development of pilot projects in selected metal recycling facilities aimed to identify and demonstrate BAT/BEP and state-of-the-art measures for U-POPs release reduction; Component 4 covers the standard monitoring and evaluation of the project. This component will also support the dissemination of experience and lesson learned from the project as a whole. It is also expected that under this component the project management capacity will be improved through a self-learning process aimed to achieve effectiveness and efficiency of project implementation.

Component 1: Policy and regulatory framework.

54. This component will focus on filling in the gaps in the policy and regulatory framework with the aim to strengthen the country capacity to achieve an effective enforcement of laws and regulations in the field of U-POPs releases from the secondary metals producing industry. GEF funding will facilitate targeted technical assistance work related to planning and development of the requirements to put in place the relevant regulatory framework and ensure sustainability of its implementation.

The description of the outcomes, outputs and activities under Component 1 is provided in the Table below:

Component 1. Policy and regulatory framework
Outcome 1: Policy and regulatory framework strengthened and enhanced for the implementation of a sound management of metal recycling in compliance with the Stockholm Convention requirements
Output 1.1: One (1) database capturing various aspects of the metal recycling chain compiled as a new tool for policy makers. Output 1.2: Specific guidelines on environment, health and safety measures in the metal recycling chain value developed. Output 1.3: Improved and harmonized national policies and regulations for environmental and health protection from metal recovery activities.
Activity 1.1: Improved survey of the scrap metal value chain in Thailand to collect updated and in-depth information of the sector, including generators, collectors and consumers of scrap metal;
Activity 1.2 Development and compilation of a database capturing all the aspects emerged during the survey and in-deep interviews to operators in order to provide a new tool for policy maker;
Activity 1.3: Develop training programmes for regulatory authorities, professionals and research institutions on technical measures based on BAT/BEP to prevent generation of U-POPs from the secondary metals producing industry and based on strategies of sustainable production and consumption.
Activity 1.4: Comprehensive examination of policies, regulations, standards and guidelines developed and applied in other countries related to the scrap metal value chain, including scrap classification, scrap collection, scrap pre-treatment and scrap melting;
Activity 1.5: Drafting of national technical guidelines and procedure manuals based on BAT/BEP and devoted to a sound management of scrap metals recycling;
Activity 1.6: Revision of existing laws and regulations, identification of gaps and development of additional regulatory measures to promote the diffusion of BAT/BEP in order to reduce emissions of U-POPs from the secondary metals producing industry;
Activity 1.7: Organization and conduct of national workshops both for institutional and technical stakeholders to present, discuss and agree on recommendations for improving the regulatory framework.
Activity 1.8: Carry out national consultations with relevant stakeholders to identify economic and financial mechanisms that can

support the implementation of BAT and BEP on the basis of the enforced laws and regulations.

55. Assistance will be provided to all key stakeholders, particularly DPIM, MONRE, ISIT, metal recycling companies, and SMEs, in order to strengthen the coordination and cooperation mechanisms in the management of this project component and to facilitate the discussion, the definition and acceptance of the improvements to the legal and regulatory framework necessary to increase control and reduce U-POPs releases from scrap metal value chain. A focus will be placed on facilitating the dialogue and the appropriate balance between the three pillars of sustainability, country's economic development, social issues and environmental protection, so that the improved regulatory framework will be both achievable and sustainable.
56. Various activities of this component are directed to remove barriers to the diffusion and acceptance of BAT and BEP and to contribute in strengthening countries' capacity at institutional and industry levels on the viability of BAT and BEP strategies. Activities to be undertaken will include training and support to local government officials to further strengthening the technical and administrative capacity to coordinate the implementation of BAT/BEP in the ferrous and non-ferrous metals producing industry. This effort will include the identification of enforcement/incentives/rewards mechanisms for the promotion of BAT/BEP for the reduction of U-POPs, taking into account the social, economic and cultural context of the country.
57. Capacity building activities will be conducted for central and local government bodies and agencies in order to provide key institutions with knowledge and expertise to formulate and implement technical, environmental and safety strategies and guiding principle consistent with a sound management of scrap metals recycling and aimed to the reduction of U-POPs releases from the secondary metals producing industry.
58. In response to national demand, specific technical guidelines, procedure manuals and training modules on environment, health and safety measures in the metal recycling chain, harmonized with international best practices, will be developed to be applied nationwide. These guidelines could include: i) standard operating procedures in the management of scrap metal that are beneficial to the full use of resources and to an environmentally sound recovery and treatment; ii) guidelines on the opportunities for the reduction of U-POPs emissions through the implementation of BAT and BEP; iii) guidelines on the technologies for scrap metal pre-treatment; iv) guidelines concerning the specification of the quality of scrap metal; v) minimum requirements for facilities collecting and treating scrap metal; and vi) safety measures for operators involved in the management and treatment of scrap metals for the protection of the workers' health and the environment.
59. The project will effectively support the improvement of the legal and regulatory framework necessary to increase control and reduce U-POPs releases from the scrap metal value chain and to facilitate and secure the widespread dissemination of BAT/BEP for the secondary metallurgical industry. The results and recommendations obtained from project activities will be presented and discussed in one workshop with the participation of government representatives, decision makers and all those who have a stake in this project component. In addition, training sessions will be organized on the adopted guidelines, procedure manuals and other tools developed for the implementation of the regulatory aspects and necessary to make the framework effective in practical terms. A dedicated workshop will be held to present and promote the proposed regulatory changes.
60. The scope of this project incorporates the promotion of technology transfer and investment by identification and implementation of new, innovative mechanisms for Private Public Partnerships and cost-sharing arrangements. BAT/BEP implementation offers opportunities for a sustainable development of the industry sector and a better quality of the environment through merging and addressing public and private interests. The private sector and commercial banks could be engaged in taking over the implementation of BAT/BEP measures under the supervision and coordination of the national government authorities while increasing reinvestment at the local scale. The design and implementation of economic and financial mechanisms that can support the implementation of BAT and BEP will be explored by the proposed project.

Component 2: Information dissemination and capacity building

61. This component will support the strengthening of the technical capacity and expertise of human resources in the management of the lifecycle of scrap metal from its collection to the transformation into secondary metals in order to promote resource conservation and resource efficiency in a manner compatible with the requirements of the Stockholm Convention. For this purpose, it will seek to identify and fill information gaps, to disseminate as widely as possible the knowledge for a sustainable management of the scrap metal value chain and to establish a technical basis within key stakeholders for identifying and implementing the most appropriate BAT/BEP measures. At the same time, this component will attempt to raise awareness of the workers and the general public on environmental and health issues related to POPs exposure. Targeted GEF support to this project component will facilitate the strengthening of national human resources and their linkage with relevant international experiences in the field of secondary metals production.

The following activities are envisaged under Component 2:

Component 2. Information dissemination and capacity building
Outcome 2.1: Increased awareness on U-POPs and BAT/BEP concepts by relevant stakeholders.
Outcome 2.2: Improved national capacity in the sound management of the recycling chain of scrap metal.
Output 2.1: Awareness raising materials and awareness raising workshop developed and implemented.
Output 2.2: Technicians and operators of the scrap metal sector are trained on BAT/BEP.
Activity 2.1: Plan and schedule a kick-off workshop ensuring the highest coverage by the public authorities, the private sector and NGOs to secure the largest national knowledge and consensus about the starting project.
Activity 2.2 Develop and carry out an awareness raising programme for the general public and the workers on issues related to POPs, on environment and health issues of scrap metals recycling and how to reduce the risk of exposure of women and infants.
Activity 2.3: Develop training materials such as training modules, slide presentations, videos, CDs, etc.
Activity 2.4 Develop and carry out targeted training for recycling associations and SMEs aimed to introduce BAT/BEP concepts for a sustainable scrap metals management including collection, storage and pre-treatment.
Activity 2.5 Develop and carry out targeted training for industry associations and operators of industrial facilities aimed to introduce BAT/BEP concepts on measures, approaches and technologies to reduce U-POPs releases from the secondary metals industry in compliance with the Stockholm Convention.
Activity 2.6 Carry out a training programme to operators of the scrap metals sector on how the technical guidelines, the procedure manuals and other tools developed under the project can practically and reasonably be applied in practice.

62. This support will be based on targeted training activities that will involve both institutional and technical stakeholders. Training material will be developed by international experts in close collaboration with national experts and with the support of industry organizations and of research institutions and agencies such as local universities. The close involvement of national experts will ensure the development of human resources for the continuation of the training programs and the widespread dissemination of knowledge beyond the project life.

63. Training programs will focus on the introduction of the BAT/BEP concepts and on the dissemination of knowledge on practices and techniques that could prevent or reduce emissions of U-POPs and other pollutants of global concern during the entire life cycle of scrap metal. Aspects such as the improvement of the flow of raw materials and the improvement of the quality of the scrap by ensuring that it is clean and free of polluting substances or substances which can produce pollutants such as U-POPs during the transformation process will be considered. In

particular, training for staff working at the scrap metal recovery facilities is envisaged with the objective to improve the ability of the scrap collectors for a better collection, classification, pre-treatment and storage of scrap. This approach should improve the quality of the scrap metal when ready for the melting furnace and thus improve the combustion performance in the furnace with consequent lower formation of U-POPs.

64. The training program will also include the dissemination of knowledge on the prevention and reduction of U-POPs emissions during thermal processes in the secondary metallurgical industry and to the building of the necessary technical capabilities to support the industry that use scrap metal from different sources on the implementation of BAT and BEP. Training will be delivered by international consultants with the involvement of national institutions and local staff that may provide training and capacity building activities on BAT/BEP. Training and technical assistance on BAT and BEP will be mainly addressed to industrial partners in order to trigger an internal awareness and to ensure that an environmentally sound scrap metal processing will become an integral part of industries' business practices. Through this training program, a number of highly trained managerial and technical specialists with professional competencies on BAT/BEP in thermal processes in the metallurgical industry to reduce U-POPs releases will be created. Trained institutions and personnel will in turn act as trainers to further expand and disseminate the project's achievements beyond the project life and will ensure that the experience gathered in the adoption of BAT/BEP may be effectively replicated in other industrial facilities, particularly in small and medium enterprises (SMEs).
65. Generally speaking, there is limited awareness in Thailand about pollutants and toxic contaminants that enter the environment as a consequence of ferrous and non-ferrous metals production. This contrast with the perception about the environmental and health impacts of U-POPs released by other industrial sectors, such as waste incinerators. This component will give an important contribution to the enhancement of environmental awareness of local institutions, industrial associations, enterprise managers, the scientific community, NGOs and the general public. Through awareness raising the project will inform stakeholders of the environmental and health impacts of ferrous and non-ferrous metals production facilities not optimized for the reduction of U-POPs releases and will promote and popularize processes, techniques and practices aimed to minimize the formation and releases of U-POPs.
66. An awareness campaign specifically targeted to communicate the health and environmental issues associated with exposure to POPs will be implemented for the general public and workers with the support of NGOs and women's associations. The project will include activities to inform on occupational protection and risk prevention in the recycling of scrap metals including secondary smelting process. Furthermore, as part of the sustainability goals of the project, awareness raising activities will be targeted for the general population, women, youth group associations and the municipalities aimed at improving overall municipal waste management processes and programs, such as waste separation and recycling, and ensuring that post-consumer scrap metal is collected at the source before its disposal as waste in landfills, according to the three R's – reduce, reuse and recycle – waste hierarchy.

Component 3: Pilot project for the demonstration of BAT/BEP in selected metal recycling facilities.

67. The demonstration of BAT/BEP to reduce releases of unintentionally produced POPs in pilot metal recycling facilities, prioritized and selected by the Government of the Kingdom of Thailand, is the major element of this project. The scope of this component is to address and demonstrate the technical feasibility of BAT/BEP implementation in order to minimize or in some cases even eliminate the potential formation and release to the environment of U-POPs and other harmful pollutants of local and global concern during thermal processes in the metallurgical industry.
68. During the PPG phase, possible demonstration activities that could be performed during the project implementation were highlighted and analyzed in detail through extensive consultations between DPIM, ISIT, UNIDO and the managers of companies. A number of enterprises were visited and evaluated as potential candidates to participate as demonstration facilities for technological improvement. The identification of appropriate demonstration technologies and the technical and economic difficulties were discussed through continuous communications and

exchange of ideas. It was agreed that, wherever possible, all interventions aimed at reducing releases of U-POPs should be in some way linked to more general issues such as Resource Efficiency and Cleaner Production strategies in order to push the scrap metal value chain in Thailand towards a sustainable development and strengthen the competitiveness of the Thai ferrous and non-ferrous metals production industry in an open global market.

69. In consultation with national stakeholders and project counterparts, the project has opted to develop four demonstration projects that will introduce BAT/BEP measures at different stages and in different sub-sectors of the scrap metal value chain in Thailand. The demonstration projects were selected in large part taking into account the needs of minimizing risk, maximizing benefits, facilitating replicability, promoting the scaling up and covering the widest range of existing issues in the recycling chain of scrap metal. Likewise, the private sectors participating in the project has committed financial and human resources to ensure that the demonstration projects will be successfully implemented in their facilities.
70. In addition, an important aspect from the point of view of the metal recycling industry was taken in account. Implementation of BAT/BEP in the metallurgical sector for the reduction of U-POPs releases is not easy to initiate since it does not enhance firms' profitability and is not demanded by ordinary market forces. The high investment and operating costs, the strong competition among metals producers and uncertainties in raw materials and metals markets make his radical change in the metals producing industry problematic. Assuming a standardized product quality, competition is based predominantly on costs and the market provides a considerable incentive to produce at the lowest cost.
71. Therefore, it is logical to link, whenever possible, energy efficiency improvements, which is related to improved profitability, with an effective and economic reduction of U-POPs releases. Energy consumption nowadays represent the most important cost factors in the metals producing industry. For metals producers the relative weight of energy in their cost structure is a strong incentive to reduce energy consumption in the production processes. Beside the global challenge of climate change, which the metals industry have to counter, an efficient use of energy will also have a positive impact on the reduction of U-POPs emission levels. Changes in operational practices that have been adopted in the metals industry to improve energy efficiency appear to have collateral benefits to reduce PCDD/PCDF emissions. Indirectly, a reduced energy consumption in the metals industry will lead to a reduced PCDD/PCDF emission also from other industrial sectors, for example from fossil fuel fired power plants that at present generate the majority of the electricity consumed in the world.

Private sector facilities for pilot demonstration of BAT/BEP

72. The first demonstration project will be implemented in partnership with The Bangkok Iron and Steel Works Co. Ltd. (BISW). The production process is based on the classic steps of steelmaking from scrap: sorting scrap metal, melting scrap metal in an electric arc furnace, secondary metallurgy to remove impurities in liquid steel, continuous casting of steel in billets, and final rolling of billets to produce bars and wire rods for the construction industry. The electric arc furnace is based on the Consteel technology, a specially designed scrap conveying system where the scrap is continuously fed via a horizontal conveyor system into the furnace while it is preheated by the off-gas leaving the furnace (flowing in counter-current) in order to recover energy. Primary and secondary emissions from the furnace are collected by means of the combination of direct extraction (through the scrap conveying system) and a canopy hood located above the furnace for the collection of fumes generated during charging and tapping as well as those escaping from the furnace. Hot gases are cooled by means of an air-to-air heat exchanger where the heat is released to ambient air by natural convection. Raw off-gases are finally treated with fabric filters. Through the utilisation of the furnace off-gas, scrap can be preheated to a temperature of approximately 800 °C prior to the final melting in the furnace vessel. This means considerable energy and cost savings with a substantial reduction in tap-to-tap times. On the other side, the scrap preheating may lead to the formation of U-POPs due to the possible presence of organic substances on the scrap which are combusted during preheating under very unfavourable conditions. This can result in increased emissions of PCDD/F into the atmosphere along with the furnace fumes.

73. The demonstration project which will be developed at BISW is very comprehensive and will cover different aspects related to the possible formation and release of unintentionally produced POPs during thermal processes in the metallurgical industry. The demonstration project will help to reduce the formation and release of U-POPs by implementing primary and secondary measures in line with the BAT/BEP guidelines developed under the Stockholm Convention. Primary measures that will be implemented in the factory include the provision of a scrap pre-treatment system to improve the scrap quality by separating non-ferrous materials in order to prevent or minimize the entry of contaminants into the furnace (a pollution prevention practice). Secondary measures that will be implemented include the improvement of the off-gas collection by a combination of hood and ducting system in the melting shop prior to cleaning in the bag-house, the installation of a post-combustion system coupled with a rapid water quench and the installation of a system for the injection of activated carbon or similar adsorptive material into the off-gas upstream to supplement the fabric filter bag-house technology. The implementation of these primary measures will be supplemented by the development and implementation of good operating and maintenance practices and continuous parameter monitoring system based on optimizing the appropriate parameters.



Figure 7 Scrap for processing at The Bangkok Iron and Steel Works Co. Ltd. (BISW).

74. The second demonstration project will be implemented in association with N.T.S. Steel Group Public Company Limited, one of the subsidiaries of Tata Steel Thailand, which is part of the Indian multinational steel-making company Tata Steel Group. The production process is based on the classic steps of steelmaking from scrap: sorting scrap metal, melting scrap metal in an electric arc furnace, secondary metallurgy to remove impurities in liquid steel, continuous casting of steel in billets, and final rolling of billets to produce bars and wire rods for the construction industry. Primary and secondary emissions from the furnace are collected by means of the combination of direct extraction (4th hole) and a canopy hood located above the furnace for the collection of fumes generated during charging and tapping as well as those escaping from the furnace. Hot gases are cooled by means of an air-to-air heat exchanger where the heat is released to ambient air by natural convection. Raw off-gases are finally treated with fabric filters. The demonstration project aims to implement BAT and BEP in the secondary production of steel from ferrous scrap. The project will help to reduce the formation and release of U-POPs by implementing primary measures such as continuous monitoring of parameters, optimization of the operating conditions of the furnace, flue gases conditioning and other primary measures in line with the BAT/BEP guidelines developed under the Stockholm Convention and other relevant sources of information, i.e., the BAT Reference Documents (BREFs) developed under the European IPPC and IED Directives [18]. This demonstration project also foresees the installation of a system for waste heat recovery (absorption chiller) from the hot gases (approx. 900°C)

collected at the 4th hole of the EAF for the generation of steam and power to be mainly used for air conditioning purposes. The system for the use of waste heat for energy saving will be alternative to the present natural convection heat exchanger. Although the planned waste heat recovery system can not be assimilated to a quenching tower, it is expected that the cooling rate of the exhaust gas will be higher than the cooling by natural convection of the current air-to-air heat exchanger and consequently the residence time in the critical temperature window for the formation of PCDD/Fs through the de-novo synthesis (500-250 °C) will be shorter. The new system should therefore be in favour of reducing the formation and release to the environment of PCDD/Fs. In addition, this demonstration project will also seek to improve the quality of ferrous scrap by ensuring that it is clean and free of impurities, including the organic contaminants which are precursors of U-POPs formation. This will be done through the installation of new equipment for ferrous scrap screening and processing which effectively remove dirt, fines and other contaminants and separate ferrous materials by means of magnetic separation leaving a cleaner product more suitable for onward furnace processing. This screening and processing of steel scrap is also able to remove organic contaminants such as plastics, etc. and thus be beneficial for the reduction of the formation of U-POPs.



Figure 8 Scrap for processing at N.T.S. Steel Group Public Company Limited

75. The third demonstration project will be implemented in partnership with Thai Metal Co., a company specialized in the extruding of aluminium and aluminium base alloy standard shapes (round bar, hexagon bar, square bar, flat bar) and other related products. These products find application in the automotive, construction, hardware tools, transportation and electronic industries. The aluminium billets, i.e. the raw material for the manufacture of the final extruded products, are produced internally by melting a blend of aluminium ingots and aluminium scrap, the latter made up of both scrap produced internally during the manufacturing cycle and of obsolete (end-of-life) scrap. This demonstration project will focus on primary measures, i.e. measures that are regarded as pollution prevention techniques to reduce or eliminate the generation and release of persistent organic pollutants and will concern both the raw material feed to the furnace that the management of the furnace. These will include improvement of the pre-sorting of feed material prior to smelting (to avoid presence of oils, organic materials including plastics in the feed material in order to reduce the generation of U-POPs due to incomplete combustion or by de novo synthesis), effective process control (to establish and maintain optimum operating conditions such as temperature, pressure, gas components, and other critical process parameters that will contribute to the minimization of U-POPs generation), and enhanced inspection and maintenance of the air pollution control system. In addition, the existing reverberatory furnace (capacity 50 tonnes) will be upgraded through the installation of regenerative burners. These burners are designed to recover heat from hot gases using two or more refractory masses which are alternatively heated and then used to preheat combustion air. The advantage of preheating the combustion air used in burners is well documented. It has been reported that regenerative burners can reduce energy consumption up to 70%

compared to that of a normal burner. It has also been reported that the use of modern regenerative burners can prevent or minimise de novo synthesis of PCDD/Fs [19]. In a regenerative burner, all flue gases from the furnace are ducted from the main chamber to two alternating regenerators. Combustion air is preheated to 800 – 1,000 °C while flue gases are cooled down below 250 °C within seconds. The fast cooling prevents recombination of dioxins in the critical temperature range from 500 °C to 250 °C. At the same time, the more homogeneous heating of the furnace prevents the creation of cold zones inside the furnace and thus the formation of dioxins through de novo synthesis.

76. In addition to reducing U-POPs emissions, the furnace's upgrade through the installation of regenerative burners will also allow significant energy savings and consequently significant reductions of CO₂ emissions. It has been estimated that the installation of the regenerative burner in the existing furnace will reduce the energy consumption for aluminum scrap melting from 3580 MJ/ton to 2300 MJ/ton. The estimated saving of liquefied petroleum gas (LPG) consumption is 460,846 kg, which correspond to about 1340 tonnes of CO₂ avoided (conversion factors: mean heating value = 46 MJ/kg LPG; specific CO₂ emission factor for LPG = 63.1 kg CO₂/GJ) [20].
77. Thai Metal has also planned further actions aimed to reduce the use of fuel and electricity and thus the reduction (direct or indirect) of CO₂ and other pollutants (possibly including U-POPs) during the production process. These actions include the installation of a new burner in the gas-fired billet heating furnace (where the aluminium billets are heated up to 450 °C before extrusion) and improvement of the whole reheating furnace (pre-heating of the billet with exhaust gas and reduction of heat losses through the furnace walls). In addition, the vaporization system of the LPG used in the casting furnace and in the billet re-heating furnace will be replaced with one with less electricity consumption. The implementation of these other planned modifications in the facility will result in further indirect reductions in CO₂ emissions. In particular, the planned reduction in the consumption of 429,662.88 kWh per year of electricity will result in an indirect reduction of CO₂ emissions of about 240 tonnes per year (specific emission factor 0.56 kg CO₂/kWh, according to the fuel types used in the power plants of the largest power producer in Thailand, the state-owned Electricity Generating Authority of Thailand, EGAT, under the Ministry of Energy) [21],
78. The fourth demonstration project will be implemented in partnership with Daiki Aluminium Industry (Thailand) Co., Ltd., an affiliated of the multinational and largest secondary aluminium smelter in Japan Daiki Aluminium Industry Co., Ltd.. The company is specialized in the manufacturing and marketing of secondary aluminium ingots produced from the melting of aluminium scrap. Typical sources of aluminium scrap are process scrap, used beverage cans (UBCs), foils, extrusions, commercial scraps, turnings, and old rolled or cast metal. In addition, aluminium is also recovered from skimmings. The factory also use primary aluminium ingots and metallic additives for the production of the different aluminium alloys. Typical process steps include pre-treatment, charging, melting, skimming, holding, treating the molten metal, and casting. Scraps such as UBCs and turnings are de-coated and de-oiled in a turning dryer (capacity 2.5 ton/hour) to improve their melting rate (and thermal efficiency) and to reduce the potential for emissions. Aluminium scrap is melted using a suite of 10 different rotary and open-well furnaces (capacity ranging from 4 to 45 tonnes). Flue gases are treated with a suite of bag filters with capacity ranging from 36,000 m³/hour (dryer) to 90,000 m³/hour (for the largest melting furnaces). Daiki is committed to be a real leader by minimizing dioxin releases to the air even it is beyond the current law requirement. Its factory at the Amata Nakhon Industrial Estate has received permission from the Department of Industrial Works (DIW) under the MoI to recycle aluminium dross as raw material for the steel industry.
79. Daiki has planned three different actions that cover different aspects of the production cycle with important impacts on decreasing U-POPs formation through the application of primary (process integrated) measures coupled with actions for energy savings. The first action consists of the improvement of the pretreatment operations which involve sorting, processing, and cleaning scrap to remove contaminants and to prepare the material for smelting. Sorting and processing separates the aluminum from other metals, dirt, oil, plastics, and paint. The second action provides for the installation of a scrap pre-heating system with the aim of recovering the heat of the exhaust gases and transfer it to the scrap prior to the melting. The third step will help in an efficient destruction of VOCs and U-

POPs through the installation of an afterburner (post-combustion) to ensure full combustion of organic compounds in the exhaust gases.



Figure 9 Aluminium scrap at Daiki Aluminium Industry (Thailand)

80. The four demonstration projects will be carried out through significant investment and in-kind co-financing (i.e. staff time during pilot demonstration) from the participating private sector companies which will be used to implement in the factories the best available technologies (BAT) and the best environmental practices (BEP) that meet the needs of the companies (increased profitability) and at the same time help to reduce emissions of U-POPs and other harmful pollutants (local and global environmental benefits). Targeted GEF support to this project component will facilitate the introduction and demonstration of international technology and experience by providing training on the most updated knowledge on BAT/BEP for the sound management of scrap metals to ensure a reduction of U-POPs releases according to the requirement of the Stockholm Convention. A portion of the support from GEF should be considered incremental to the important domestic investment which will allow Thailand to move towards an enhanced capacity to address issues related to the global releases of POPs.
81. Since the techniques and technologies that will be introduced during the development of this component have been tested and proven successful throughout the world, the project expects that these techniques/technologies and approaches will be applied with success in these demonstration projects. It is expected that the activities implemented at the selected demonstration enterprises with the introduction of suitable BAT/BEP will allow an immediate reduction of PCDD/F releases at the end of the project life which has been estimated in not less than 23 g TEQ/year. This reduction will also be maintained for the years following the closure of the 5-year project period and will extend for the likely 15-years projected lifetime of the equipment installed, as a direct result of the project. Furthermore, the replication in different facilities of the techniques/technologies implemented in the demonstration facilities and supported by the strengthened regulatory framework will allow a further reduction which could add up to about 200 g TEQ/a of PCDD/F avoided assuming that the structure of the secondary metallurgical industry in Thailand remains unchanged during this time period. In addition, an added benefit of the project strategy is the reduction of the releases of other harmful pollutants (particulate matter, heavy metals, mercury, polycyclic aromatic hydrocarbons, etc.) and CO₂ from this source category.
82. Before implementing BAT/BEP measures, a preliminary baseline monitoring campaign for U-POPs and other pollutants of concern such as particulate matter, heavy metals, mercury, PAHs, and GHGs will be carried out where feasible, in order to evaluate the environmental impact indicators of the proposed demonstration project. Internationally acknowledged methods for sampling at the stack and determination of PCDD/F and other pollutants will be adopted. Monitoring programs will be repeated after the project activities have been completed at the selected facilities, in order to monitor and document the decrease in releases of U-POPs and other pollutants achieved by each of the demonstration projects. Therefore, the project will provide valuable emissions data

calculated on actual technology and plant operating practices and will contribute to the update of the collections of emission factors, including the emission factors reported in the “Toolkit for Identification and Quantification of Releases of Dioxins, Furans and Other Unintentional POPs” developed under the Stockholm Convention.

83. The demonstration will involve not only the support for the deployment of physical equipment, but it will be supplemented by training of local staff on the use and maintenance of the new technology. Moreover, major stakeholders will be trained on BAT/BEP that could be applied in the secondary metals industry through workshops that will be organized in the period of implementation of the demonstration projects. In this way, national experts will be available after project completion for a nationwide diffusion of the acquired knowledge and will support Thailand in meeting its obligations under the Stockholm Convention.
84. During the demonstration project, economic and environmental performance will be assessed and documented. The operating conditions of the facilities will be monitored with regard to operating data such as process temperatures, energy consumption, exhaust gas flows, mass flows of raw materials, finished products and residues, etc., in particular in conjunction with the planned emission monitoring campaigns, in order to correlate the specific emissions of U-POPs and other pollutants of concern with the actual conditions of the plants and to evaluate costs, benefits, technical performance and environmental impacts.
85. The activities, the results and the lesson learned from the demonstration projects carried out under this component will be the subject of case study reports that will be disseminated to the stakeholder community at national and global level. These reports will inform and guide government authorities in planning and developing legislative instruments, guidelines and technical regulations as well as draw the basis for ensuring the replicability of the project's success and the sustainability in the future of project's achievement. At the same time, these reports will inform companies about the new technologies and practices introduced by the demonstration project so that this technological advancement experience can be shared and form the basis of the growth of the industrial sector in accordance with the objectives of sustainable development and according with the obligations of the Stockholm Convention and the future national legislation.

The description of the outcomes, outputs and activities under Component 3 is provided in the Table below:

Component 3. Pilot project for the demonstration of BAT/BEP in selected metal recycling facilities.
Outcome 3. State-of-the-art primary and secondary measures for U-POPs release reduction in selected facilities identified and deployed.
Output 3.1. BAT/BEP measures identified and implemented for scrap collectors and scrap consumers
Output 3.2. Training of technical staff and other potentially interested local stakeholders (environmental authority, SMEs, scrap collectors, etc.) in the management of BAT/BEP undertaken
Output 3.3. Results of the implemented demonstration projects published and disseminated for replication through collaboration with existing financial institutions in the country.
Activity 3.1 Collect detailed technical and environmental data at the selected demonstration facilities and formulate quantifiable impact indicators. Consider socio-economic data and gender dimension under the current practices.
Activity 3.2 Perform preliminary monitoring campaigns for U-POPs and other pollutants of concern released into the environment under the current operating conditions in the selected demonstration facilities.
Activity 3.3. Develop and implement a work plan for the introduction of BAT/BEP in the selected demonstration facilities. Consider climate change mitigation/adaptation measures, socio economic implications and gender dimension.
Activity 3.4. Implement BAT/BEP in the selected demonstration facilities.
Activity 3.5. Perform monitoring campaigns for U-POPs and other pollutants of concern released into the environment

after the implementation of BAT/BEP in the selected demonstration facilities.

Activity 3.6. Comprehensive assessment of the effects (technical, environmental, socio-economic and other co-benefits) of the implemented BAT/BEP in the selected demonstration facilities on the basis of the formulated impact indicators.

Activity 3.7. Develop and carry out a training programme for technical staff of the selected demonstration facilities and other potentially interested local stakeholders (i.e. staff of the environmental authority) on the management of BAT/BEP.

Activity 3.8. Publish and disseminate the relevant results of the implemented demonstration projects for replication.

Activity 3.9. Promote awareness of existing financial schemes in the country to incentivize the replication and the wide diffusion of BAT/BEP.

Component 4: Monitoring and evaluation; knowledge management and dissemination

85. The purpose of Component 4 is to generate and ensure systematic support for managing all activities related to monitoring, evaluation and reporting on progresses and results of the project in order to guarantee the achievement of project objectives, as well as to promote the internal circulation of knowledge and the external dissemination of the results of the project. This will include the creation of a project management structure to allow coordination between project partners and the establishment of a system for monitoring & evaluation of the impact and the sustainability of the project activities. It is also expected that under this component the project management capacity will be improved through a self-learning process aimed to achieve effectiveness and efficiency of project implementation.

86. Project monitoring and evaluation (M&E) will be conducted in accordance with UNIDO and GEF requirements and procedures. The impact indicators and the means of verification of the performance are reported in the Project Results Framework and will be used to monitor progresses of the project during the five years life time. A fine-tuning of verifiable indicators and means of verification, their interactions with the work plan and the definition of responsibilities will be performed at the Project Inception Workshop and included in the Project Inception Report.

Component 4 will comprise of the following activities:

Component 4. Monitoring and evaluation; knowledge management and dissemination

Outcome 4. Effective monitoring and evaluation of project impact and sustainability implemented.

Output 4.1. Project M&E designed and implemented.

Output 4.2 Lessons-learned disseminated

Activity 4.1 Establish a Project Steering Committee (PSC).

Activity 4.2 Hold a Project Inception Workshop within the first three months of project start and prepare an Inception Report.

Activity 4.3 Design and implement the monitoring and evaluation framework including the definition of impact indicators and the design of a detailed monitoring plan

Activity 4.4 Undertake day-to-day monitoring of the overall project activities as well as periodic progress reviews and associated effectiveness evaluations.

Activity 4.5 Hold Project Steering Committee meetings at least once a year.

Activity 4.6 Draft and approve annual work-plans on planned project activities and outputs.

Activity 4.8 Carry out an independent project mid-term external evaluation (after 30 months of implementation).

Activity 4.9 Carry out an independent project final evaluation (at project completion).

Activity 4.10 Prepare Project Terminal report.

Activity 4.11 Carry out dissemination of lessons-learned and experiences at national, regional and global level

A.1.4 Incremental/additional cost reasoning and expected contributions from the baseline, the GEFTF, LDCF, SCCF, CBIT and co-financing;

87. GEF intervention is needed to remove the policy, regulatory, technical and other barriers which hamper the implementation and diffusion of Best Available Techniques and Best Environmental Practices along the whole scrap metal value chain in Thailand. In the absence of GEF support this could potentially occur but in a fragmented manner, less coordinated, at a much slower speed, and without the substantial benefit of international experience that GEF and UNIDO bring. The holistic approach designed for the project will contribute to the efficient use of international financial resources.

88. The expected global environmental benefits of these activities has been quantified in an immediate reduction of not less than 23 g TEQ/year at the end of the project life as a result of the activities carried out with the pilot project at the selected demonstration enterprises with the introduction of suitable BAT/BEP. This reduction will also be maintained for the years following the closure of the 5-year project period and will extend for the likely 15-years projected lifetime of the equipment installed. Furthermore, the replication in different facilities of the techniques/technologies implemented in the demonstration facilities and supported by the strengthened regulatory framework will allow a further reduction which could add up to about 200 g TEQ/a of PCDD/F avoided assuming that the structure of the secondary metallurgical industry in Thailand remains unchanged during this time period. In addition, an added benefit of the project strategy is the reduction of the releases of other harmful pollutants (particulate matter, heavy metals, mercury, polycyclic aromatic hydrocarbons, etc.) and greenhouse gases (CO₂) from the group source of ferrous and non-ferrous metal production. This will have immediate global impact by protecting human health and the environment from harmful impacts of U-POPs as well as other pollutants of global concern such as mercury. The outcomes of the project will also have important local impacts by improving occupational health and safety of the workers besides the environment of the local communities.

89. The project, with USD 4.5 million in GEF funding, has leveraged around USD 33 million in co-financing. The incremental investment from GEF will make a critical difference in the transformation of the scrap metal value chain in Thailand with the associated global environmental benefits, as evidenced by comparing the baseline and alternative scenarios provided in Table 5 below.

Table 5 : Incremental cost reasoning

Component 1. Policy and regulatory framework.			
Outcome 1: Policy and regulatory framework strengthened and enhanced for the implementation of a sound management of metal recycling in compliance with the Stockholm Convention requirements.			
Baseline situation and associated baseline	Alternative scenario (incremental activities)	Co-financing budget* (USD)	GEF grant (USD)

projects			
<p>Five industry sectors are regulated in terms of U-POPs releases. A policy and regulatory framework has still to be developed and implemented by the government for the metallurgical industry.</p> <p>Limited coordination at the institutional level for a joint development of a policy and regulatory framework for the metallurgical industry.</p> <p>Limited institutional capabilities to provide support to the implementation of BAT/BEP.</p> <p>U-POPs inventory outdated and incomplete regarding the metallurgical industry.</p> <p>DPIM has initiated projects related to the management of scrap metals. However, U-POPs issues have not been considered so far.</p>	<p>Improved coordination among various ministries.</p> <p>A database with communication facilities to collect, store and retrieve information of the metal recycling chain, as a new tool for policy makers.</p> <p>Training delivered to regulatory authorities, professionals and research institutions on technical measures based on BAT/BEP to prevent generation of U-POPs from the secondary metals producing industry.</p> <p>National technical guidelines and procedure manuals based on BAT/BEP for a sound management of scrap metals recycling developed.</p> <p>New or additional regulatory measures to promote the diffusion of BAT/BEP in order to reduce emissions of U-POPs from the secondary metals producing industry developed.</p>	1,460,144	275,000
Component 2: Information dissemination and capacity building			
Outcome 2.1: Increased awareness on U-POPs and BAT/BEP concepts by relevant stakeholders			
Outcome 2.2: Improved national capacity in the sound management of the recycling chain of scrap metal.			
Baseline	Alternative scenario (incremental activities)	Co-financing budget (USD)	GEF grant (USD)
Limited actions on information dissemination and capacity building.	Training and awareness program aiming to provide the basis for the development of a sustainable scrap metal	5,507,200	625,000

<p>Awareness on U-POPs issues by the industry is still very limited.</p> <p>Limited technical knowledge on the U-POPs issues and related BAT/BEP in the metals industry sector.</p> <p>Awareness on the environmental issues and gender mainstreaming in the scrap metal management activities is substantially absent.</p>	<p>recycling industry in Thailand.</p> <p>New technical information on appropriate BAT/BEP to reduce emissions of U-POPs from thermal processes in the metallurgical industry disseminated.</p> <p>Equal access to training, information and awareness raising events according to the requirements for gender mainstreaming as per the GEF, UN and country policies.</p>		
Component 3. Pilot project for the demonstration of BAT/BEP in selected metal recycling facilities.			
Outcome 3. State-of-the-art primary and secondary measures for U-POPs release reduction in selected facilities identified and deployed.			
Baseline	Alternative scenario (incremental activities)	Co-financing budget (USD)	GEF grant (USD)
<p>PCD in coordination with DEQP conducted sampling and analysis activities to some metallurgical facilities</p> <p>Facilities investing on energy, material and process improvement but no BAT/BEP implemented or demonstrated for the reduction of releases of U-POPs.</p>	<p>Support for pilot projects on demonstration of BAT/BEP for the reduction of U-POPs releases implemented and demonstrated in four facilities</p> <p>Technical staff of the demonstration facilities and other potentially interested local stakeholders trained on BAT/BEP and U-POPs issue.</p> <p>Not less than 23 g-TEQ/year avoided at the end of the project with a potential reduction of 200 g-TEQ/year as a result of project replication.</p>	24,247,442	3,150,000
Component 4: Monitoring and evaluation; knowledge management and dissemination			
Outcome 4. Effective monitoring and evaluation of project impact and sustainability implemented.			
Baseline	Alternative scenario	Co-financing budget	GEF grant

	(incremental activities)	(USD)	(USD)
No baseline exists for this component.	Project implementation monitored and evaluated. Project experience documented and disseminated.	1,500,000	250,000

A.1.5 Global environmental benefits (GEFTF) and/or adaptation benefits (LDCF/SCCF);

90. The global environmental benefit expected from the implementation of the proposed project is to protect human health and the environment from harmful impacts of U-POPs and other pollutants of global significance released from scrap metal recycling facilities. The Project's most significant contribution is the reduction of PCDD/F releases from scrap metal smelting facilities which will be achieved through the implementation of project activities envisaged for Component 3. As reported in Table 6 below, the potential PCDD/F reduction from the demonstration activities that will be carried out in the four demonstration facilities has been estimated to be 46.7 g-TEQ/year - from a current total of 59.1 g-TEQ/year (21.2 g-TEQ/year to air and 37.9 g-TEQ/year to residues) to a total of 12.45 g-TEQ/year (0.15 g-TEQ/year to air and 12.3 g-TEQ/year to residues). This estimate has been carried out on the basis of the default emission factors and methodology reported in the UNEP "Toolkit for Identification and Quantification of Releases of Dioxins, Furans and Other Unintentional POPs" (January 2013) and by assuming that the pilot facilities, supposed to be in Class 1, will be brought in Class 3 at the end of the project. To be conservative, by assuming that at least 50% of this potential can be captured with the implementation of BAT and BEP envisaged in the pilot plants, a total reduction of not less than 23 g-TEQ/year could be achieved. In addition, the emissions of other U-POPs such as PCBs, HCB, PeCB and PCNs will be also reduced, even if it is not possible to estimate this reduction at this stage.

Table 6: Estimated potential of reduction of PCDD/Fs releases with the proposed demonstration activities according to default emission factors reported in the UNEP Toolkit, January 2013.

Pilot Plant	Source category	Plant capacity	Actual level (Class 1)		BAT-based plant (Class 3)		Potential PCDD/F reduction (total) g TEQ/year
			Emission g TEQ/year		Emission g TEQ/year		
			Air	Residues	Air	Residues	
BISW	Secondary steel	400,000	4.0	6.0	0.04	0.04	9.92
NTS	Secondary steel	500,000	5.0	7.5	0.05	0.05	12.4
Thai Metal	Secondary aluminium	50,000	5.0	10.0	0.025	5.0	9.97
Daiki	Secondary aluminium	72,000	7.2	14.4	0.036	7.2	14.4
Total potential PCDD/Fs reduction from the four demonstration facilities							46.7

91. Considering that in Thailand there are 11 aluminium ingot manufacturers and 23 secondary steel plants similar to the pilot plants participating in the project, it is possible to estimate that the replication of the project results will allow a further reduction which could add up to about 200 g TEQ/year of PCDD/F avoided, assuming that the structure of the secondary metallurgical industry in Thailand remains unchanged during this time period. Obviously, it is important to point out that additional investment beyond the technical assistance provided in this project are

needed to achieve these additional global benefits. The project is intended precisely to pave the way to allow the release of this significant resources needed for achieving this significant global environmental benefit.

92. There is a growing body of evidence that climate change will have broad negative impacts on the behaviour and fate of POPs in the environment. Climate change is likely to increase exposure to POPs in some regions due to temperature-driven changes in their environmental behaviour. In addition, climate change will lead to changes in precipitation patterns and will also affect the atmospheric and oceanic circulation patterns, which will lead to faster and more efficient long-range transport of POPs. Melting of polar ice caps as well as loss of permafrost, snow melting, flooding events and desertification induced by climate change will also contribute to the redistribution of POPs and their transfer to the atmosphere or to aquatic and terrestrial ecosystems. In addition to the many abiotic factors that can influence the environmental transfer of POPs, organic carbon cycling, lipid dynamics and food web structures in terrestrial and aquatic systems can be adversely affected by climate change, which will in turn alter POPs transfer in biota
93. Synergistic effect of reduction of pollutant releases and energy efficiency is also envisaged in the project. The reduction of U-POPs releases from the metal recycling chain also impacts on the reduction of other pollutants of local, regional and global significance, for instance particulate matter, VOCs, PAHs, heavy metals and mercury. This reduction is very important for the improvement of local air quality and for the improvement of the quality of life of present and future generations. Working conditions and worker's health and safety would be also positively impacted. At the moment, it is not possible to quantify these reductions of releases and subsequent benefits in a reliable manner. However, the project will undertake quantification of the additional release reductions of pollutants which are globally significant associated with the reduction of U-POPs releases.
94. While the project primarily aims at introducing BAT and BEP to reduce U-POPs releases from metal recycling facilities, it would also look at other cross-cutting benefits including minimization of resource use (energy, water, raw materials). For metal producers the relative weight of energy in their cost structure is a strong incentive to reduce energy consumption in the production processes. In this project, the promotion of BAT/BEP to reduce U-POPs releases from metal recycling facilities has been linked to the improvement of energy efficiency and this aspect has been included in all project components. Therefore, the proposed project not only poses no climate change risks but present the added benefit of a reduction of negative environmental impacts due to a reduced greenhouse gas (GHG) emissions. Available data for one demonstration project indicates an expected reduction of 1580 tonnes of CO₂ per year from the planned modifications. At this stage, quantification of these additional benefits for the other demonstration facilities is still incomplete and challenging.

A.1.6 Innovativeness, sustainability and potential for scaling up.

95. The importance of the involvement of the private sector in sectoral projects such as this cannot be over emphasized. The degree of commitment shown by the private sectors partners to introduce BAT/BEP for environmentally-sound production processes and technologies enhances the sustainability and potential for scale-up of the outputs of the project. In return, the enhancement of process and energy efficiency couple with pollutant emission reduction enhances the competitiveness of the pilot facilities. These gains, if properly institutionalized and disseminated, will catalyze and sustain the interventions implemented in this sector.
96. The most relevant innovativeness of the proposed project in a rapidly industrializing country such as Thailand is that the scrap metal value chain is seen as a whole from the point of view of U-POPs formation and releases during thermal processes in the metallurgical industry. This innovative approach considers the entire recovery and recycling cycle of scrap metal the same way to that now in place in advanced municipal solid waste (MSW) incinerators. BAT/BEP for MSW include appropriate coordination with upstream activities and waste management techniques such as waste inspection, proper waste handling, appropriate selection of site, consideration of environmental impacts of siting, etc., coupled with on-site procedures such as control of waste input, appropriate

techniques for combustion, flue gas, solid residue and effluent treatment, etc.. A similar approach has been designed for the scrap metal value chain in Thailand.

97. As repeatedly stated in the BAT/BEP guidelines/guidance, primary measures should be implemented together with appropriate secondary measures to ensure the greatest minimization and reduction of emissions possible. This innovative project seeks to maximize the environmental benefits by introducing and disseminating a variety of on-site and off-site measures and by establishing a comprehensive system for the environmental sustainability of the secondary ferrous and non-ferrous metals production industry in the light of the obligations set out by the Stockholm Convention. Reaching compliance with BAT/BEP requirements, firstly call for an efficient end-of-life collection of products, an effective sorting and treatment after collection, strict control over raw material sources, the implementation of best practices of physical separation and scrap pre-treatment, the minimization of feed materials contaminated with POPs or with contaminants leading to the formation of such pollutants, with particular attention to the removal of organic contaminants. Secondly, metallurgical technologies designed to achieve complete combustion and minimize U-POPs formation, including good feed preparation, controlled feed rate, controlled temperature, residence time, turbulence, and so on. Lastly, the adoption of suitable secondary (end-of-pipe) measures as a means to minimize, even eliminate, the amount of U-POPs in the final flue gas emission to the atmosphere. Moreover, BAT/BEP concept includes not only “end-of-pipe” technologies for pollution abatement after its generation but also include know-how, organization and management. All this aspects are considered in this innovative project.
98. Through a number of specific disseminating activities, the project seeks to ensure national and international replicability of the experience gained. These include, among others: (i) training of local staff and experts for countrywide replication of the implementation and adoption of BAT/BEP measures; (ii) preparation of awareness-raising materials; (iii) generation of technical manual containing guidance and guidelines on BAT/BEP measures applied to the metallurgical industry; (iv) documentation of the project results on the application of the BAT/BEP in the scrap metal value chain. Documentation, dissemination and training will secure sustainability by creating an enduring knowledge base throughout the country. The strengthened regulatory framework will help to confirm and “lock in” technical advances.
99. Information and lesson learned will be disseminated nationally and internationally during dedicated workshops, through scientific, broad-spectrum publications and informative material in order to promote wider replicability of the experience acquired. The dissemination of results and lessons learned during the implementation of this project could prove highly relevant to especially small and medium sized companies with less technical capacity. Knowledge transfer will be facilitated and supported through the UNIDO’s role in the promotion and dissemination of industry-related knowledge for sustainable industrial development in developing countries and economies in transition.
100. The large number of facilities operating in the industry sector, coupled with the expected growth of the secondary ferrous and non-ferrous metals production, would provide ample replicability potential within the sector. Furthermore, the experience gained in the ferrous and non-ferrous metals production industry could be also of benefit to other sectors obliged to reduce emissions of U-POPs in line with the compliance requirements of the Stockholm Convention.
101. DPIM under MOI has potential to sustain the project after its implementation because this project is in line with DPIM mandates which are: (1) implementation of the Minerals Act B.E. 2560, for example, mining license, mineral dressing and metallurgical processing license, mineral royalty, purchase, sale and storage of minerals; (2) making policy for primary industry, mining and industrial logistic, management following the national plan and industrial sector needs; (3) promotion and support for academic advice, research, and activities to develop the primary industry, mining and industrial logistic.
102. In a long-term perspective, the experience gained during the realization of the project can be very helpful for other developing countries in other regions of the world that are currently marginally interested in the problem. For

instance, Africa is expected to gain prominence in the future as an iron ore-producing region and inevitably the secondary metals industry will develop and expand in the future. Approaches and procedures developed and applied during the project for the introduction and implementation of BAT/BEP in the thermal processes of the metallurgical industry in Thailand could be replicated when ferrous and non-ferrous metals production in Africa will take off.

A.2. *Child Project?* If this is a child project under a program, describe how the components contribute to the overall program impact.

Not applicable.

A.3. *Stakeholders.* Identify key stakeholders and elaborate on how the key stakeholders engagement is incorporated in the preparation and implementation of the project. Do they include civil society organizations (yes /no)? and indigenous peoples (yes /no)?⁸

103. While the project envisages collaboration with civil society on its activities, the participation of indigenous people is not foreseen. During the PPG, several stakeholders' consultation (please refer to **Annex C**) was conducted to understand the possible role and contribution of each partner. The following will be the main stakeholders that will be involved during the project implementation:

Stakeholder	Key function and mandate	Role in the project
Department of Primary Industries and Mines, Ministry of Industry	DPIM, under the Ministry of Industry, is responsible for developing primary industries and mining. It oversees, supervises, promotes and support mining and metallurgical activities including their derivative primary industries to raise the industrial productivity and competitiveness and to fulfill the demands for sustainable utilization of mineral resources while protecting environmental quality and public safety. Reduction of U-POPs emission from basic metal facilities is in line with DPIM's mandate.	DPIM will be the lead executing partner. It will be primarily involved in the review of policies and guidelines, as well as awareness raising and capacity building, on the metals recycling sector.
Pollution Control Department (PCD), Ministry of Natural Resources and Environment	PCD has the missions to regulate, supervise, direct, coordinate, monitor and evaluate with respect to rehabilitation, protection and conservation of environmental quality. Within its role, PCD sets and enforces environmental standards for all industrial sectors, including metallurgical.	PCD is the focal department under MoNRE that oversees the obligation of the country to the Stockholm Convention on POPs. Standards on POPs and U-POPs are under the purview of the Department.
Department of Environmental Quality	DEQP has core mandates to promote	DEQP will be involved on

⁸ As per the GEF-6 Corporate Results Framework in the GEF Programming Directions and GEF-6 Gender Core Indicators in the Gender Equality Action Plan, provide information on these specific indicators on stakeholders (including civil society organization and indigenous peoples) and gender.

Promotion (DEQP), Ministry of Natural Resources and Environment	public awareness and public participation in conservation of natural resources and the environment and in formulation of environmental policy and planning, and to conduct research and analysis work including developing and transferring technology for environmental management.	awareness raising and information dissemination.
Environmental Research and Training Centre (ERTC), Department of Environmental Quality Promotion (DEQP), Ministry of Natural Resources and Environment	ERTC is the technical and research “arm” of DEQP and is responsible for monitoring, research and training activities. The Dioxin Laboratory at ERTC, opened in 2013, was the first in the South East Asian Region. The lab is specialized in sampling and analysis of ambient air.	ERTC under DEQP will be involved in dioxin monitoring and awareness raising.
Iron and Steel Institute of Thailand (ISIT)	ISIT is an independent body established by the Ministry of Industry in November 2000 under the Industrial Development Foundation. The Institute represents the united intention of the state and the private sector to see effective co-ordination of their efforts in enhancing the strength of the iron and steel industry development in Thailand. ISIT aims to develop Thai iron and steel industry to be internationally competitive and effectively drive the development of strategic industry.	ISIT will provide coordination function with the private sector. They may also be involved in capacity building.
The Bangkok Iron and Steel Works Co. Ltd. (BISW)	BISW is a producer of steel in Thailand. BISW produces billets, reinforcing bars and wire rods in accordance to Thailand Industrial Standard (TIS). Its current capacity is 400,000 t.p.a.. Main equipment consists of one Consteel © electric arc furnace, one 3-strand continuous casting machine, re-bar and wire rods rolling mills.	BISW participates as demonstration facility in the project.
N.T.S. Steel Group Public Company Limited	N.T.S. is one of the subsidiaries of Tata Steel Thailand, which is part of the Indian multinational steel-making company Tata Steel Group. N.T.S. produces billets, wire rods, round bars and deformed bars. Its current capacity is 500,000 t.p.a.. Main equipment consists of one electric arc furnace, one continuous casting machine, re-bar and wire rods rolling mills. N.T.S. participates as demonstration facility in the project.	NTS Steel Group participates as demonstration facility in the project.
Thai Metal Co. Ltd.	Thai Metal Co., is a company	Thai Metal Co., participates as

	specialized in the extruding of aluminium and aluminium base alloy standard shapes and other products. Secondary aluminium billets are produced by melting primary aluminium ingots and aluminium scrap in reverberatory furnaces. Current capacity is 50,000 t.p.a.. Thai Metal participates as demonstration facility in the project.	demonstration facility in the project.
Daiki Aluminium Industry (Thailand) Co., Ltd.	Daiki (Thailand) is an affiliated of the Japanese Daiki Aluminium Industry Co., Ltd.. The company is specialized in the manufacturing of secondary aluminium ingots produced from the melting of aluminium scrap. Aluminium scrap is melted using a suite of 10 different rotary and open-well furnaces. Daiki participates as demonstration facility in the project.	Daiki Aluminum Industry participates as demonstration facility in the project.
UAE-IDEA Advance Analytical Company Limited	UAE-IDEA is a Thai Laboratory for sampling and analysis of dioxins and furans and other POPs by using Gas-Chromatography/High Resolution Mass Spectrometry (GC/HRMS) in industrial and environmental samples, including industry stack sampling.	The laboratory will be involved in POPs analysis.

In addition to the key stakeholders above, a number of potential additional stakeholders that includes industry associations, universities, NGOs, research centers and CSOs, have been identified and will be engaged during project implementation wherever relevant.

A.4. *Gender Equality and Women's Empowerment.* Elaborate on how gender equality and women's empowerment issues are mainstreamed into the project implementation and monitoring, taking into account the differences, needs, roles and priorities of women and men. In addition, 1) did the project conduct a gender analysis during project preparation (yes /no)?; 2) did the project incorporate a gender responsive project results framework, including sex-disaggregated indicators (yes /no)?; and 3) what is the share of women and men direct beneficiaries (women 20%, 80%)?⁹

104. Gender and Development (GAD) considerations will be made an integral part of the project strategy in consideration of the Gender policies of the GEF, UNIDO and the Government of Thailand. A detailed gender analysis (**Annex H**) of the metallurgical sector in Thailand was conducted during the preparatory phase of the project to mainstream gender dimensions into the project elements. The study looked at the steel and aluminum sectors of Thailand and provided recommendations based on the data gathered on how gender maybe mainstreamed in the project. Gender indicators were also provided in the logical framework of the project. A midterm and final analysis on gender mainstreaming will be undertaken in order to measure the success of the project on this issue.

⁹ Same as footnote 8 above.

105. It has been noted that one of the key actions undertaken by the GEF relative to gender mainstreaming was to incorporate gender responsive approaches and indicators in the GEF-6 focal area strategies in which focal area projects will incorporate GEF gender indicators which will be monitored in the project eventually. UNIDO, for its part, recognizes the significant positive impact on sustained economic growth and sustainable industrial development generated by gender equality and the empowerment of women. UNIDO adopted a policy on Gender Equality and the Empowerment of Women in 2009. As a consequence, the organization commits to engage all men and women equally in all of its organizational practices, policies, programmes and projects. Gender dimensions are now a prerequisite in the design, implementation, monitoring and evaluation of programs, projects and activities with tools and guidelines on mainstreaming gender in the whole gamut of project management.
106. This project aims at building awareness on UPOPs, envisioning examples of successful cases that apply BAT/BEP in the Thai context, and having a policy implication. The project elements include health impacts of exposure to dioxins for men and women, and all groups of vulnerable populations, such as female workers. Awareness raising activities within the project envisages involvement of national relevant ministries, NGOs and civil society organizations operating in the area of gender, safety and health in the workplace and the environment.
107. In a detailed study of the gender-related elements of the metallurgical sector in Thailand, it was found out that women represent about 33.7% of workers employed in the industry (according to the estimates from Labour Force Survey) as provided in **Figure 7** below.

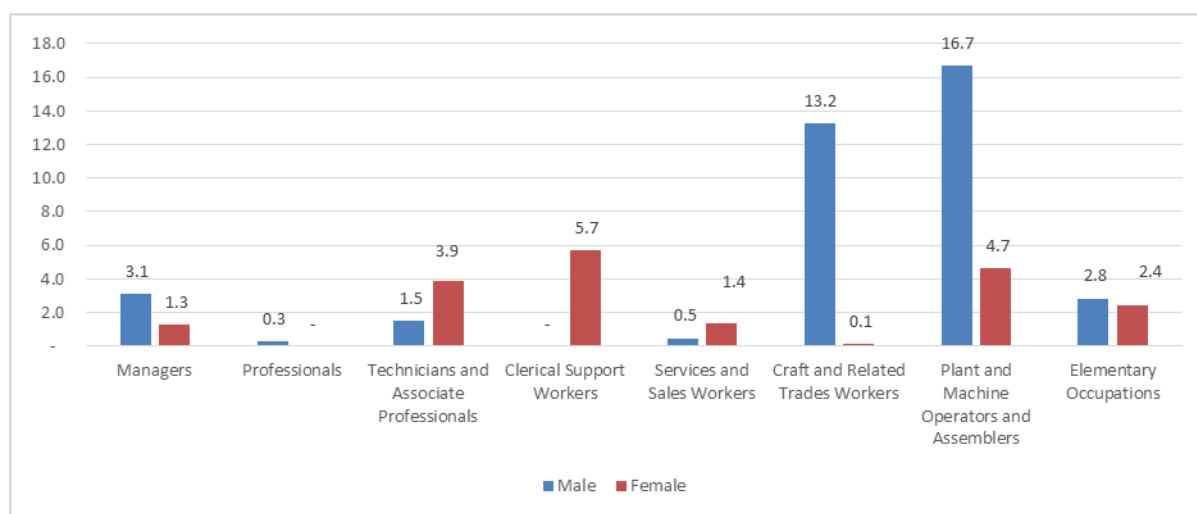


Figure 7: Representation of male and female in the metallurgical industry

108. Interviews with selected establishments suggested a wide range of female employment between 8.7 and 32.5 per cent, depending on the products, technology applied, and management priorities. Women tend to work in areas with less physical demands as compared to men. They account for a smaller proportion of the workforce because of the very nature of the industry. The majority of women employed work in administrative posts, or in detailed jobs like quality assurance. It is noteworthy that women still play a minor role in the trade unions of the metal industry.
109. Data collection and interviews were conducted with three selected establishments (one aluminium operator and two steel business operators.). As shown in **Figure 8**, the female share accounts for 8.7 and 32.5 per cent of total employment in steel and aluminium industry accordingly.

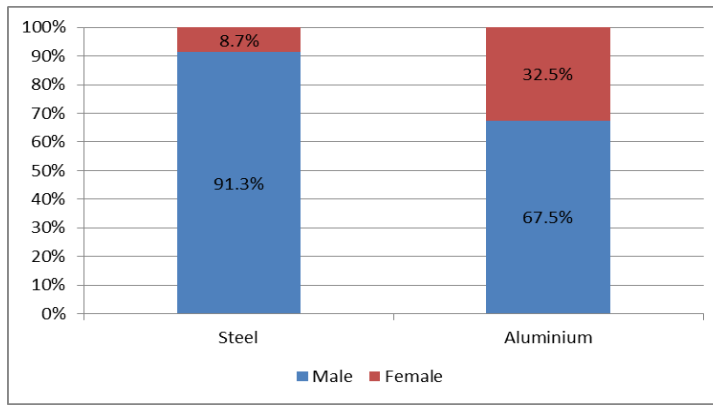


Figure 8: Percentage of male and female in the steel and aluminum facilities interviewed

110. The gender analysis conducted during the PPG resulted in the following conclusions:

- There is a clear division of labour as the majority of the female works in office-oriented jobs, whereas the majority of male works in field-oriented jobs. Based on the interviews, decision-making does not reflect concerns on gender, but on tasks. It implies neutral concerns of awareness on gender in the industry.
- There is awareness on the gender issues among government authorities. To illustrate, a Gender Focal Point at the Pollution Control Department of MoNRE has been appointed and is tasked to raise awareness on gender equality in the organization. There is also a “Women, Child labour and labour Protection Network Group” in the Ministry of Labour responsible for issues on women and gender, among its functions.
- Thailand also has a number of NGOs engaged on raising awareness on prevailing gender concerns. However, most activities on gender are focused in the light industries as this sector employs a larger number of women and are mostly informal. Likewise, the issue of POPs/UPOPs is tackled only by very few NGOs.
- The occupational health issue does not address POPs/UPOs in the workplace. Among the business operators and workers, concerns on dust, noise and odor pollution are the priorities. The issues on the impacts of chemical and wastes at the workplace is normally a secondary and are monitored at the minimum as required by law. According to the interviews with stakeholders from the industry, none of them fully understand U-POPs or dioxin. Only one OSH officer has heard about dioxin, yet understood that dioxin is released only by the petroleum/ energy industry. Therefore, the understanding about POPs/UPOPs and its impact on health of women and men must be promoted.

111. A gender analysis matrix (**Table 7**) has been developed to understand the gender issues that maybe addressed by the project for the stakeholders (communities) affected by them. The four levels included in the analysis include women, men, household and community while the four categories of analysis include labour, time, resources, and socio-cultural criteria.

Table 7: Gender Analysis Matrix

	Labour	Time	Resources	Culture
Women	+ Acquire new/	+ in the	+ Reduce UPOPs in	+ Increase awareness on

(Direct beneficiary)	advance skills in BAT/ BEP (particular with those directly impacted.)	long term, reduce the possibility of sickness.	the environment ? Access to income generation and social activities (In case of the employment is increasing.) + Training, and maintenance take more time.	UPOPs + Change working attitude toward environmentally- friendly technologies.
Men (Direct beneficiary)	+ Acquire new/ advance skills in BAT/ BEP (particular with those directly impacted.)	+ in the long term, reduce the possibility of sickness.	+ Reduce UPOPs in the environment + Better health (reduce the negative impact caused by UPOPs.) + Training, and maintenance take more time.	+ Increase awareness on UPOPs + Change working attitude toward environmentally- friendly technologies.
Household	+ Skills improved	+ in the long term, reduce the possibility of sickness of household member.	+Better health (reduce the negative impact caused by UPOPs.) ? Possibility to increase income	+ Increase awareness on UPOPs and gender issues.
Community	+ Increase in employment	+ in the long term, reduce the possibility of sickness of household member.	+ Better health (reduce the negative impact caused by UPOPs.)	+Possibility to reduce the negative impact due to possible symptoms caused by UPOPs .

Note: + positive impact; - negative impact

112. In the implementation of the project, the following shall be done in order to integrate gender dimension in the whole gamut of project management. These steps maybe distinct activities or maybe incorporated in the different activity components of the project:

- Collection and analysis of sex-disaggregated data and qualitative information to understand roles and needs of women and men in the project. This will be done both at the project team level and project implementation level. Identification of the number of female and male project team members, determination of the roles and responsibilities in the project and ensure that in the documentation of the various project activities, contribution

of male and female participants are documented through attendance sheet and other project document. Target of at least 20% women and 80% men is considered reasonable considering the concerned sector.

- The project must ensure that the project activities meet the specific needs of women and men. Capacity building activities will ensure that training curricula and tools are developed to accommodate the different education/skill levels that may exist between women and men.
- Mechanisms to ensure gender balanced representation and participation in project activities and decision-making processes (target at least 20% of whichever sex is underrepresented) will be established.
- Gender-specific targets or performance indicators that track gender results and impact including number of men and women, number of gender sensitive publication produced by the project, etc. will be developed.
- Any adverse impacts or risks that may affect the equal access to, equal participation in and/or equal benefit from project activities among women and men will be taken into account.
- Equal opportunity for women and men in the management and implementation arrangements of project will be ensured.
- Sufficient financial resources for gender equality and women's empowerment activities will be allocated. The PMU should attend a basic gender course. Also, gender expert consultant will be engaged to ensure gender issues are addressed during implementation; a comprehensive gender analysis and baseline exercise in the field at project implementation will be undertaken.
- Capacity within the project team and among stakeholders to ensure gender-responsive implementation and the continued integration of a gender perspective within the sector/area of intervention after the project ends will be endeavored.
- Access, participation, and benefits among women and men and incorporate remedial action that redresses any gender inequalities in project implementation will be monitored. Report on how gender is mainstreamed will be generated and mid-term reviews, assessments, audits, etc. will include gender as a specific criteria/component.

113. A set of recommendations that identify opportunities and entry points for mainstreaming gender into the project are developed and presented in **Table 8** below.

Table 8: Preliminary recommendations on gender mainstreaming by components of the project

Expected outcome	Planned achievement/ expected outputs	Gender responsive Indicators (no. of men/women)
Component 2 Information dissemination and capacity building 2.1 Increased awareness on BAT/BEP concepts by relevant stakeholders	2.1 Technical training for technicians in the relevant industries and awareness raising workshops developed and implemented	At least 5 per cent of the total employment in the STEM (Science, technology, engineering and mathematics) professionals involved in the training. Equal access to training for men and women ensured.
		At least 30 per cent of participating OSH officers to participate in the training and fully understand about POPs/UPOPs. Equal access to training for men and women ensured.
		At least 20 per cent of decision making personnel to participate in the training and fully understand about POPs/UPOPs. Equal access to training for men and women ensured.
		At least 20 per cent of government officials participating in the training are female.

Expected outcome	Planned achievement/ expected outputs	Gender responsive Indicators (no. of men/women)
	2.2 Awareness raising materials and technical guidelines formulated	<p data-bbox="773 207 1385 306">One set of awareness raising materials and technical guidelines developed to feature impacts of POPs/UPOPs on men and women.</p> <p data-bbox="773 352 1385 516">At least 5 per cent of participants in one conference/ seminar to disseminate the case study are teachers/ lecturers from vocational schools and universities. Equal access to training for men and women ensured.</p>
<p data-bbox="194 554 464 747">Component 3: Pilot project for the demonstration of BAT/BEP in selected metal recycling facilities</p> <p data-bbox="194 785 472 1016">Outcome 3. State-of-the-art primary and secondary measures for U-POPs release reduction in selected facilities identified and deployed</p>	3.2 Training of local stakeholders and technical staff in management of BAT/BEP measures undertaken.	<p data-bbox="773 554 1370 680">At least 20 per cent of the total employment in the non-technical/ non-STEM professionals to be involved in the training. Equal access to training for men and women ensured.</p> <p data-bbox="773 718 1385 882">At least 2 trainings for trainers about the impact on POPs/UPOPs and how BAT/BEP can help reducing the risk from POPs/UPOPs are carried out for the trade union on steels and metal. At least 50 per cent of the trainees are women.</p> <p data-bbox="773 919 1385 1188">Produce one booklet of best practices in Thai to be distributed to all relevant NGOs/ trade unions, government officials, and educational institution and distribute at least 1,000 copies and through online. The booklet must, at least, contain information about POPs/UPOPs, different impacts of envisioned BAT/BEP in Thailand. Gender sensitive publication must be produced.</p> <p data-bbox="773 1226 1385 1386">Disseminate case studies about POPs/UPOPs and BAT/BEP through vocational & high level education schools providing opportunities for factory visits/ in plant training at least twice. Equal access to training for men and women ensured.</p>
<p data-bbox="194 1396 399 1522">Component 4 Monitoring and Evaluation</p>	4.1 Effective monitoring and evaluation of project impact and sustainability	Monitoring of gender indicators to be made an integral part of project management.

A.5 Risk. Elaborate on indicated risks, including climate change, potential social and environmental risks that might prevent the project objectives from being achieved, and, if possible, the proposed measures that address these risks at the time of project implementation.(table format acceptable):

114. The project was designed on the basis of the best information available since the start of the PIF formulation. This information was enlarged and deepened during the PPG phase in order to reduce areas of uncertainty and minimize risks of project failure. However, as in all projects and particularly those involving a large number of stakeholders with different interests, some uncertain assumptions remain which give rise to possible risks. The design of the project and of the monitoring and evaluation mechanism is sufficiently robust to limit the most common project implementation risks.
115. The key risks which were identified and that could threaten the achievement of project results have been summarized in the **Table 9** below and listed by project component. The overall risk for the project is considered medium. The risk matrix also include mitigation strategies adopted so far and those that will be implemented during the development of the project. These identified risks will be monitored during the project implementation and further countermeasures will be adopted if needed.

Table 9: Risks Analysis

Risk	Risk level	Mitigation measures
<i>Component 1. Policy and regulatory framework</i>		
Lack of coordination and cooperation between institutional stakeholders such as MoI and MONRE in the development of new or additional regulatory measures for environmental and health protection from metal recovery activities.	Low	During the preparatory phase of the project proposal all key institutional stakeholders showed a strong commitment in addressing environmental issues and a positive working relationship between them. All institutional stakeholders will be represented in the Project Steering Committee in order to be able to express their ideas with respect to roles and responsibilities of their own institution and to participate in the development of new or additional legislation. Multi- and inter-ministerial interactions will facilitate consensus in legislative improvement
The development of new or additional regulatory measures for metal recovery activities is being opposed by the private sector and thus not adopted.	Medium	The industrial sector has already expressed its commitment to participate in the project thus indicating its awareness of the problem posed by U-POPs. Possible risks to reconsideration by the industry will be mitigated by targeted training and awareness raising campaigns. Demonstration projects, benefiting from the advice of international experts, will present the feasibility of the implementation of BAT and BEP.
<i>Component 2. Information dissemination and capacity building</i>		
Private stakeholders (recycling and industry associations, operators of industrial facilities, etc.) are not actively participating in the training components of the project.	Low	Relevant target stakeholders will be identified and engaged early on in the project's implementation and encouraged to participate in capacity building and awareness raising activities. Training needs will be assessed and pre- and post-training analysis will be undertaken.
Low participation and interest from the workers and the general public in the education program.	Medium	Public awareness activities will be carefully designed and different methodologies and targeted materials will be developed to generate interest and participation.

		Issues broader than U-POPs will be addressed such as sound municipal waste management and waste separation and recycling. The dissemination of information on U-POPs, environment and health issues linked to scrap metals recycling will be addressed through a careful design of awareness raising products including the use of social media networks and with the assistance of professional organizations for the arrangement of promotional events and activities.
Component 3: Pilot project for the demonstration of BAT/BEP in selected metal recycling facilities.		
Low co-operation among scrap recyclers, smelter facilities and other stakeholders.	Medium	The success of the project depend directly on the support and co-operation of all stakeholders. These will be fully involved since the initial stages of the project implementation in order to identify all potential conflicting interest. The project will ensure the co-operation of the involved stakeholders via regular communication and outreach.
BAT/BEP implementation is no longer supported by the private sector due to reduced commitment, economic and financial reasons linked to high investment and operating costs, unforeseen technical or environmental problems.	Medium	Private sector companies were involved during the PPG phase for the identification of possible demonstration activities that could be performed during the project implementation. Whenever possible, the effective and economic reduction of U-POPs releases was linked to energy efficiency and material efficiency improvements in order to improve profitability and thus encouraging them in the formulation of the demonstration projects. The possibility of having the support of international experience in planning and carrying out activities, the support in technology transfer and, last but not least, the financial assistance that GEF provides are all incentives for an active participation of the private sector. The project specifically seeks to reduce the risk of abandoning the commitment through capacity building and awareness raising activities in order to help the private sector in identifying opportunities to participate and in finding potential benefits. This will enable enterprises to have a complete understanding of the problem and to take a more general and long-term vision. All four pilot facilities have been identified and have provided concrete cofinancing commitment to the project.
BAT/BEP measures will not achieve the expected release reduction target.	Medium	Demonstration projects are always uncertain as to the final outcome due to their inherent complexity. This risk is also linked to the fact that the emission estimates in the current scenario and in the BAT-based final scenario are based on default emission values or, in some cases, on expert judgment. During the project, each demonstration site will undergo through in-deep

		assessment of technical feasibility, expected benefits, cost, and environmental and social impact. Design of projects will be adjusted as needed to account for conditions identified during these assessments. Demonstration projects will be built on techniques and practices recognized by the BAT/BEP guidelines/guidance developed under the Stockholm Convention, documents inspired by the EU regulation (BREFs) and other guidance documents on selection of suitable technologies.
Component 4: Monitoring and evaluation; knowledge management and dissemination		
Failure in achieving a long-term reduction of U-POPs releases because of the difficulty to replicate and sustain the project results.	Low	The strengthening of the policy and regulatory framework and the promulgation of national standards, coupled with the raised awareness and the capacity transferred to the enterprises through the training activities should provide the basis for the sustainability of the outputs of the project in the long term. To mitigate the risk, the project will support close stakeholder consultation to accept and sustain national industry and environmental policies and motivate manufacturing companies to comply with these policies.
Failure in achieving a wide (national, regional, global) dissemination of lessons learned and project results.	Low	Adequate dissemination of lesson learned and project results is crucial to the replication and sustainability of project outcomes. This is strictly linked to the commitment of the managers of demonstration facilities to share experiences and results. The project recognize that some enterprises are reluctant to get involved in sharing their own experiences for confidentiality reasons. Design of the knowledge management and dissemination will be adjusted as needed to account for identified situations of sensitivity and confidentiality of information. The awareness raising and capacity building activities integrated into the project design should ensure sufficient understanding to allow enterprises to assume a more open attitude.

No particular climate change risk is currently identifiable for the implementation of BAT and BEP in secondary metals production [22].

A.6. Institutional Arrangement and Coordination. Describe the institutional arrangement for project implementation. Elaborate on the planned coordination with other relevant GEF-financed projects and other initiatives.

A.6.1 Institutional Arrangement

116. The institutional arrangement for project implementation is provided in **Figure 10** below. UNIDO is the GEF Implementing Agency (IA) for the project. A project officer will be appointed in UNIDO HQ to oversee the implementation of the project, assisted by a support staff and supervised by a senior professional staff engaged in

the management and coordination of UNIDO's Stockholm Convention Programme. The UNIDO Regional Office in Thailand will also play a significant role in the supervision and monitoring of the project. UNIDO country-level monitoring will be provided as part of the in-kind contribution of the organization to the project.

UNIDO will provide both implementation and limited execution functions. It will provide full oversight of the project and will be responsible in the recruitment of international experts and some national experts, including the PMU. Procurement of major equipment/services will also be undertaken by UNIDO in accordance with its procurement rules and procedures.

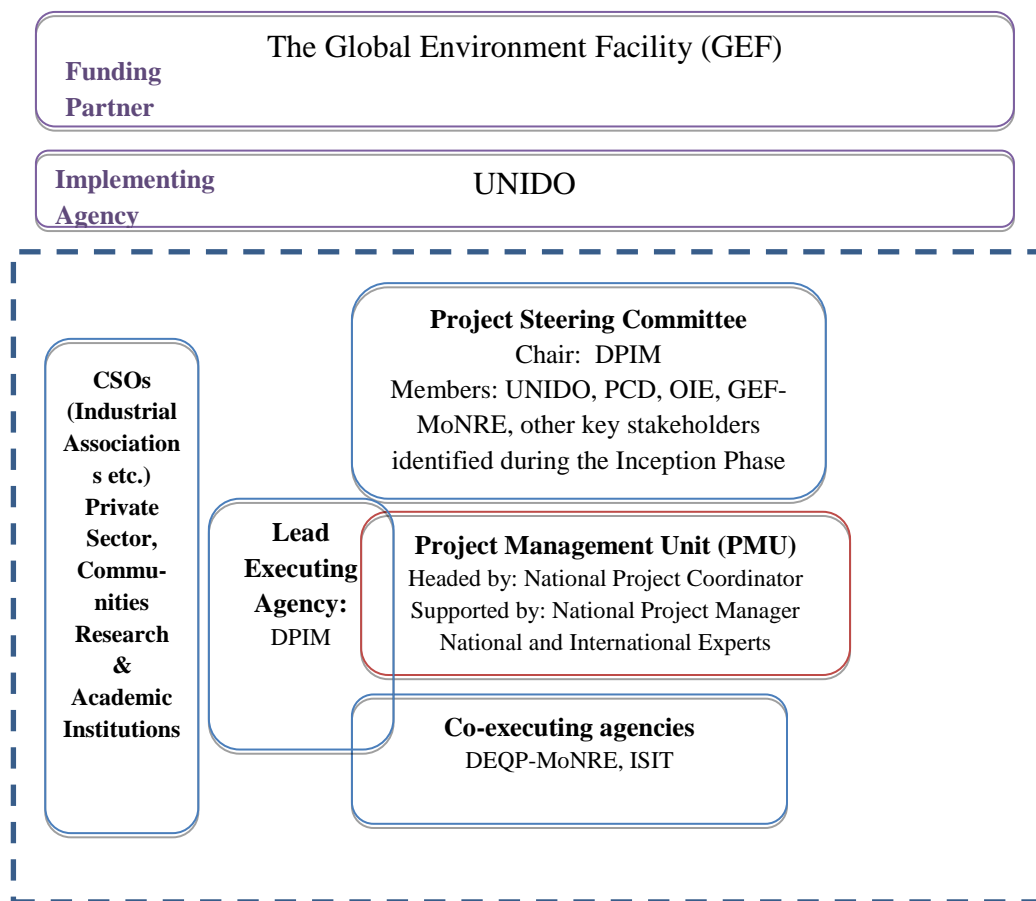


Figure 10: Project implementation structure

117. The Department of Primary Industries and Mines will be the lead executing agency for the project. Co-executing institutions will include the:

- Pollution Control Division of the Ministry of Natural Resources and the Environment to work on NIP-POPs and emission standards in the metallurgical sector
- Department of Environmental Quality Promotion (DEQP), to conduct dioxin monitoring and public awareness raising and capacity building on U-POPs management
- Iron and Steel Institute of Thailand will provide coordination and technical services to the pilot facilities. It may also be engaged in the execution of some awareness raising and capacity building activities.

118. The Project Management Unit will be established within the premises of the DPIM. A National Project Director (NPD) from DPIM will be appointed and would chair the Project Steering Committee. A National Project

Coordinator (NPC), also from the Ministry, will be assigned by the NPD to oversee the activities of the project. A National Project Manager (NPM) will be recruited by UNIDO to manage and execute the day-to-day tasks required by the project and a Project Assistant who will be in charge of the administrative functions required. UNIDO will provide execution support by recruiting international and national experts based on specific required tasks. The NPM will be responsible for drafting the reportorial requirements of the project including progress reports, annual work plans, GEF project implementation report (PIRs) and country reporting requirements based on the prescribed formats. The PMU is responsible for informing UNIDO of any delays or difficulties during the implementation so that appropriate support or corrective measures can be adopted in a timely and remedial fashion.

119. Targets and indicators will be reviewed annually as part of the internal evaluation and planning processes undertaken by the PMU. The project will also adhere to the Environmental and Social Management Plan (ESMP) as proposed in **Annex I**.
120. A Project Steering Committee (PSC) will be established, chaired by the National Project Director from DPIM and will comprise of representatives from relevant ministries, including PCD, Office of Industrial Economics (OIE) which is the designated agency of the MOI for international affairs, GEF-MonRE, UNIDO and other relevant stakeholders. The members of the PSC will be finalized during the project inception phase. The PSC will hold its regular sessions at least once a year throughout the project implementation, but additional meetings can be held if necessary. Technical Working Groups (TWGs) will be established depending on the requirements of the project. The TORs of both PSC and TWG will be formulated and agreed during the project inception phase. The PSC and TWG should make necessary decisions within the rules and regulations of UNIDO and the GEF as per GEF C.39/Inf.03.
121. UNIDO will enter into contractual arrangements with reputable institutions in the country for the relevant activities of Component 1: Policy and regulatory framework and Component 2: Information and capacity building. The institutions maybe appointed through internal evaluations of qualifications and upon endorsement of the Technical Working Group or a restricted, competitive bidding involving only reputable national institutions maybe conducted.
122. For Component 3, UNIDO will engage experts from the Italian National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA) to conduct the in-depth assessment of the facilities and monitor the interventions to be implemented. Equipment, technologies or services that will be required by the pilot facilities will be acquired through a global, competitive bidding under UNIDO Procurement rules.
123. The Evaluation component of the project will be managed by UNIDO, in coordination with its Independent Evaluation Division.
124. Full or partial ownership of equipment/assets purchased under the project may be transferred to national counterparts and/or project beneficiaries during the project implementation as deemed appropriate by the UNIDO project Manager in consultation with the project counterparts/stakeholders.

A.6.2 Coordination with other GEF-financed projects and other initiatives

The proposed project will build on experiences and lesson learned from past and ongoing related UNIDO/GEF projects and other initiatives on BAT/BEP. Some of them have, as their target, the metallurgical industry, others are aimed at different domains. Complementarities with other projects on the efforts for the target sector are envisaged through sharing of experiences and exchange of relevant information on BAT/BEP. The project will utilize the experience gained and the capacity already built through UNIDO BAT/BEP projects in the metallurgical industry in PR China, Vietnam, ESEA region, as well as in Turkey. Close coordination and cooperation is targeted with the Regional BAT/BEP Forum for East and South East Asia (ESEA) and its activities such as the projects on the introduction of BAT/BEP on fossil fuel-fired utilities and industrial boilers and the project on the demonstration of BAT/BEP in open burning activities.

The proposed project will also complement other GEF projects in Thailand:

GEF ID 3786: Energy Efficiency

125. The results and lessons learned from *GEF project 3786 on Energy Efficiency* which promoted energy efficiency in the industries (including the metallurgical sector) through the introduction of ISO Energy Management Standard incorporating industrial energy systems will be considered during the project implementation. The project will also support and complement the activities of the following GEF projects in Thailand.

GEF ID 9219: Application of industry-urban symbiosis and green chemistry for low emission and persistent organic pollutants free industrial development in Thailand

126. This proposed project offers a holistic approach to reduce releases of GHG emissions and POPs at their source at factory, industrial zone and urban area level. The combination of proposed methodologies will encourage investment in technological solutions at three levels by applying a step-by-step approach: (i) within factories; (ii) among factories (eco-industrial zones), and (iii) between industry and urban centers (eco-industrial town). The below scheme illustrates the principles of industry-urban symbiosis. The industry-urban symbiosis principles apply environmentally sound methods and practices in an innovative and holistic approach encompassing enterprises via the integration of resource efficient and cleaner production (RECP) and industrial ecology. The industrial ecology applies environmental targets, such as the reduction of emissions and energy consumption, with social and economic well-being. These principles are also being observed in the implementation of BAT/BEP. Capacity building and awareness raising components will be coordinated and complemented by the two projects.

GEF ID 9847. Enabling activities to review and update the national implementation plan for the Stockholm Convention on Persistent Organic Pollutants

127. This project will enable Thailand to establish inventories of products and articles containing new POPs and to identify industrial processes where new POPs are employed or unintentionally produced, especially regarding the POPs listed in 2015. This project will undertake qualitative assessments of existing data, new data and gaps, which in turn will provide the necessary basis for decision-makers to delegate the national approach to eliminating and reducing POPs releases into the environment. The current project will be able to contribute in the inventory of U-POPs in the metallurgical sector, including provision of primary data to check the emission factors provided in the Dioxin Toolkit.

Additional Information not well elaborated at PIF Stage:

A.7 *Benefits*. Describe the socioeconomic benefits to be delivered by the project at the national and local levels. How do these benefits translate in supporting the achievement of global environment benefits (GEF Trust Fund) or adaptation benefits (LDCF/SCCF)?

128. Overall, the project addresses different aspects of the scrap metal value chain in Thailand and will deliver various and significant socio-economic benefits at the local and national level, which will support and facilitate the achievement of the global environmental benefits expected from the reduction of U-POPs releases. Global environmental benefits and national socio-economic benefits derive directly from the objectives that the project aims to achieve. During the project execution, data will be collected for assessing the achievement of the global environment benefits. At the same time, the socio-economic impacts of the project intervention will be assessed, also including gender-disaggregated data, specifically those related to capacity development under the various project components.
129. The proposed project will directly improve the well-being of citizens of Thailand at local and national level due to the reduction of environmental levels of U-POPs and reduced exposure to others air pollutants. This is particularly true for the most vulnerable parts of the population, i.e. women, children and the elderly and those living in close proximity to the production sites. At the same time, the implementation of the project will improve occupational environment of workers. These improvements will ultimately reduce human distress and health care costs.
130. The holistic approach of the project aims to involve the entire chain of supply of scrap metal. Through awareness raising activities targeting the general population, the separation and collection programs of waste at source and in particular the separation of post-consumer scrap metal will be disseminated and strengthened to promote recycling. This will allow environmental and economic benefits by maximizing scrap metal stream capture and will support the achievement of sustainable development goals of Thailand.
131. Formal and informal scrap pickers and collectors will be involved in awareness raising and capacity building activities in order to avoid improper storage of scrap metal and the possible contamination of soils, surface waters and groundwater from contaminants contained in the scrap and leached by rain, thus protecting ecosystems, biodiversity, and eventually the human health. Through the involvement of the recycling associations, the project will seek to integrate the current informal segment of the scrap metal recycling chain in a more structured but environmentally sustainable system. This could cause some socio-economic changes in individuals by bringing their income levels up from current low level resulting in better social and economic conditions.
132. Capacity building activities targeted at scrap collectors and suppliers will make them aware of the pressing need for the smelting industry to have an improved flow of raw material which is clean and free of pollutants when it ultimately get processed. The project will improve the capacity of the country to provide domestic scrap metal of better quality thus avoiding the import by the industry of cleaner but more expensive foreign recycled materials. This will allow a better economic condition of domestic scrap collectors because scrap metal of optimized quality can be sold to the industry at a higher price. The project will build this capacity by disseminating information and knowledge on techniques for an improved collection and pre-treatment of scrap metal.
133. The promotion of BAT/BEP in thermal processes of the metallurgical industry is a relatively new issue for Thailand. The technical capacity developed by the project partners (project staff, stakeholders, etc.) and by the beneficiaries of the training activities will allow for the creation of skills and capacities and would provide an opportunity to raise new professional figures and to create new employment opportunities. Moreover, it could provide the basis for the development of domestic research programs involving industry, academia and research institutions for the development of new technologies that could be used to prevent and reduce the releases of U-POPs and other pollutants of concern. This would contribute to the economic growth while supporting a sustainable development of the industry in the country.

134. One of the main goals of the project is to improve and support the environmentally sound management of the recycling chain of pre-consumer and post-consumer scrap metal in Thailand. In the longer term, major changes are required to make consumption and production patterns more sustainable in a context of increasing growth. The project will assist people in doing things differently and changing their behaviour through the introduction of tools and technologies, processes, organizations and strategies. The project primarily involves manufacturing industries and directs them towards environmentally-friendly practices while attempting to improve performance (i.e. lower costs, increased revenues, improved services, etc.). Beyond the technical side of changes, this impacts on the management, processes and workflows of the enterprise and, ultimately, how individual employees do their work.
135. The project addresses one of the most important industrial sectors and one of the most significant source categories of U-POPs releases. This project offers a unique opportunity to promote in Thailand the sustainable use of resources by simultaneously coping with sustainable development goals and global environmental challenges. From a national, regional and global perspective, the successful implementation of this project will demonstrate the feasibility of setting up sustainable secondary metal production activities and to establish a system capable of reducing environmental impacts and health effects. This would be a major achievement for Thailand, as part of its environmental commitment, with impacts at regional and global level.

A.8 Knowledge Management. Elaborate on the knowledge management approach for the project, including, if any, plans for the project to learn from other relevant projects and initiatives (e.g. participate in trainings, conferences, stakeholder exchanges, virtual networks, project twinning) and plans for the project to assess and document in a user-friendly form (e.g. lessons learned briefs, engaging websites, guidebooks based on experience) and share these experiences and expertise (e.g. participate in community of practices, organize seminars, trainings and conferences) with relevant stakeholders.

136. Knowledge management is a key part of the project and several opportunities for the dissemination of the information generated as output of the activities are embedded into the different components of the project. In Component 1, technical guidelines and manuals on environment, health and safety measures in the metal recycling chain value will be published and shared with relevant stakeholders within and beyond the project intervention area. Training materials (training modules, slide presentations, videos, CDs, etc.) developed for technical and in-plant workshops under Component 2 as well as training assessment reports will be made available at national, regional and global level through a suitable website as permanent courses/resources. Knowledge products and lessons learned under Component 3 will be documented and shared nationally and internationally in order to facilitate the replication of the achievements of the initial core of demonstration facilities and to be beneficial in the design and implementation of similar future projects. Finally, the knowledge management and dissemination part of Component 4 provide a strategy related to outreach and dissemination of the project experience as a whole.
137. The knowledge management approach will apply several measures to guarantee an optimal level of dissemination of knowledge and project results, including both an efficient communication inside the project and an optimal communication towards external stakeholders, mainly in the countries but also with a worldwide perspective. Periodic bulletins/newsletters will be released by the Project Manager on a regular basis to inform the stakeholders and project partners about the main progresses of the activities. The possibility to use available social media platforms such as Facebook and Twitter to further disseminate internally and/or externally relevant information on project activities will be explored and evaluated by the project.
138. During the implementation of the proposed project, several workshops will be held to disseminate technical concepts on BAT and BEP and to facilitate the exchange of ideas between people. New knowledge generated during the implementation of the project and lesson learned will be documented and disseminated through reports, information materials, articles published in professional and general public media, UNIDO and project websites and other relevant online platforms. Technical results will be presented in relevant national and international conferences or scientific meetings. The project team, in consultation with UNIDO and other relevant stakeholders,

will evaluate the most appropriate form and the structure of the formal publication. Knowledge and experience will be disseminated through other UNIDO projects/regional hubs in the area of U-POPs reduction.

139. Channels will be created to include knowledge and data sharing among the general public and civil society to an adequate and reasonable extent. User-friendly summaries, flyers, posters, brochures, and multi-media materials will be prepared and disseminated in order to inform on the project's concept and create awareness on U-POPs-related human health and environmental risks and the benefits from reducing and/or eliminating them with the use of BAT and BEP. These activities will be integrated into public awareness programs carried out during and beyond the project life.
140. In terms of learning from other relevant projects and initiatives, the proposed project will build on experiences and lesson learned from past and ongoing related GEF-funded projects and other initiatives on BAT/BEP. Some of them have as their target the metallurgical industry, others are aimed at different domains. Complementarities of with other projects on the efforts for the target sector are envisaged through sharing of experiences and exchange of relevant information on BAT/BEP. The project will utilize the experience gained and the capacity already built through UNIDO BAT/BEP projects in the metallurgical industry in PR China, Vietnam, ESEA region, as well as in Turkey. Close coordination and cooperation is targeted with the Regional BAT/BEP Forum for East and South East Asia (ESEA) and its activities such as the projects on the introduction of BAT/BEP on fossil fuel-fired utilities and industrial boilers and the project on the demonstration of BAT/BEP in open burning activities.
141. Lesson learned in this project and achievements in the form of knowledge, skill and tools may be applied in similar developing countries in the fast growing Asian region to facilitate their own compliance with the Stockholm Convention and to enhance the local technical and institutional capabilities. The project could serve as a model for many developing and emerging countries experiencing rapid industrialization and economic growth.

B. DESCRIPTION OF THE CONSISTENCY OF THE PROJECT WITH:

B.1 Consistency with National Priorities. Describe the consistency of the project with national strategies and plans or reports and assessments under relevant conventions such as NAPAs, NAPs, ASGM NAPs, MIAs, NBSAPs, NCs, TNAs, NCSAs, NIPs, PRSPs, NPFE, BURs, INDCs, etc.:

142. The Sustainable Development Goals (SDG) 12.4 which aims to achieve, by 2020, the environmentally sound management of chemicals and all wastes throughout their life cycle on chemicals and wastes, sits at the core of Thailand's the Post-2015 Development Agenda. The project responds directly to the country's demand for technical assistance on toxic chemical management, in accordance with the Stockholm Convention on POPs.
143. Thailand signed the Stockholm Convention on POPs since May 2002 and ratified it on 31 January 2005. The National Implementation Plan (NIP) was developed to demonstrate how the obligations of the Convention will be implemented. The NIP was transmitted to the SC Secretariat on May 2007. The NIP provides policy and strategy frameworks as well as action plans and activities to meet objectives specific to Thailand. Pursuant to requirements related to measures for reducing releases of U-POPs as referred to in Article 5 of the Convention, Thailand has determined the following main activities:
- Update inventory data and projected releases for PCDD/Fs emissions from all source categories;
 - Update and revise existing legislation as well as establishing new legislation to include all potential source categories for PCDD/Fs;
 - Promote BAT for new sources as identified in Part II, Annex C after 4-year period of entry into force, as determined in the Convention;
 - Promote BEP for new and existing sources as identified in Part II and Part III of the Convention.

144. Specific priority objectives and activities are reported in the Action Plan on unintentional POPs, Chapter 3.6.3., pages 66-74 of the NIP. Promoting the application of BAT/BEP in industries which are potential sources of PCDD/Fs is reported as Goal 6.
145. Thailand, with technical support from UNIDO and financial support from GEF, has now started the process for NIP review and update to take into account the chemicals added from 2009 until 2015 as POPs into the Annexes to the Convention. The NIP update process will enable Thailand to establish inventories of products and articles containing the “new” POPs, to identify industrial processes where the “new” POPs are used or unintentionally produced, and to design prioritized post-NIP projects to implement the SC. In addition, the issues, national objectives and priorities for the original twelve POPs will be updated and reviewed, including an updated emission inventory of old and new U-POPs and a list of action plans on old and new U-POPs. Promoting the application of BAT/BEP in industries which are potential sources of PCDD/Fs U-POPs releases such as thermal processes in the metallurgical industry will remain a priority for Thailand.
146. The proposed project is fully consistent with the country’s development strategies and with the environmental policies regarding the control and reduction of pollution and of hazardous chemicals set under the Enhancement and Conservation of National Environmental Quality Act B.E. 2535 (1992), the 12th National Economic and Social Development Plan 2017-2021, and the National Environmental Quality Management Plan 2017-2021. Through the reduction of U-POPs releases from thermal processes in the metallurgical industry, the project will assist the Government of Thailand to meet its priorities in promoting the sound management of chemicals throughout their life-cycle to reduce risks to human health and the environment. Moreover, the project will also promote the sustainable use of natural resources through the environmentally sound recovery and recycling of metal waste.
147. The proposed project is also fully consistent with the vision, the mission and the four Strategic Agendas of the Ministry of Industry Strategic Plan 2017 – 2021. The conceptual framework of this plan tracks the trajectory for future industrial development in Thailand and, among others, include key concepts such as competitiveness in the global economy, sustainable and responsible development of industries, improvement of industrial supply chains by using local resources and full use of industrial waste, promotion of environmentally friendly production processes and products, sharing of knowledge and public participation.
148. The proposed project will also greatly contribute to the commitment of the Government of Thailand to be a learning hub on environmental-related topics as proposed by the Permanent Secretary of the Ministry of Natural Resources and Environment at the Second GMS Environment Ministers Meeting (EMM-2) held in Lao PDR. The meeting took stock of achievements of the GMS Core Environment Program (CEP) since its inception in April 2006 and discussed emerging environment, conservation and poverty reduction issues such as climate change, global warming and their effects on socio-economic growth and development. It is envisaged that, once implemented successfully, the participating pilot facilities could provide learning and training on BAT/BEP technologies in the metallurgical sector.

C. DESCRIBE THE BUDGETED M & E PLAN:

149. Monitoring and evaluation (M&E) of project development is a key element of the project design and will be performed at project outcome, project output and project activity levels as well as at functional and management levels. The main purpose of the M&E program will be to measure and document implementation progress towards outcomes and objectives according to verifiable indicators and related means of verification. Evaluation of performances will assist in monitoring effectiveness and results, identifying underperforming activities and suggesting remediating actions, monitoring project risks and flagging project risks early on, refining further work in order to ensure a coherent, coordinated and timely achievement of project objectives in accordance with the project results framework.. At the same time, it will support the communication and coordination mechanism of the project network, the compilation of lesson learned from the project and the dissemination to the primary

stakeholders as well as the international community of the knowledge and experience acquired during the project lifetime.

150. According to the Monitoring and Evaluation policy of the GEF and UNIDO, follow-up studies including Country Portfolio Evaluations and Thematic Evaluations can be initiated and conducted. All project partners and contractors are obliged to (i) make available studies, reports and other documentation related to the project and (ii) facilitate interviews with staff involved in the project activities.
151. The project results will be monitored annually and evaluated periodically during project implementation as part of the planning processes undertaken by the project team in accordance with established GEF and UNIDO monitoring and evaluation procedures.. The evidence of outputs such as the number of participants in training activities, the release of reports and manuals, site visits at demonstration facilities, etc. will confirm the congruence of outcomes and objectives.
152. Day to day monitoring of project execution progress will be performed by the PMU according to the work plan and identified indicators reported in the project's Annual Work Plan. The Project Team will inform UNIDO of any delays or difficulties faced during implementation so that the appropriate support or corrective measures can be adopted in a timely manner.
153. Annual monitoring and evaluation will occur through PSC meetings which will take place once a year. The first such meeting will be held within twelve months of the start of full project implementation. The final evaluation will be performed at the end of project life and will consider the implementation of the project as a whole, paying attention to whether the project has achieved its stated objectives and contributed to the global environmental objective.

154. Project Management Activities

Inception Phase

At the start of the Project, a role in the project organization structure will be assigned to the project targets groups and all stakeholders in order to support the management of the project. This will include the establishment and the designation of members of the Project Steering Committee (PSC) and of the Project Management Unit (PMU) with its Project Manager (PM).

An Inception Workshop (IW) will be held within the first 3 months of project start. The IW aims to introduce, finalize and approve the implementation structure of the project, define the exact role, function and responsibility of the project team (government counterparts, UNIDO, PSC, PMU, co-financing partners, project execution partners, relevant stakeholders, etc.), and plan the first year Annual Work Plan (AWP) including appropriate indicators and related means of measuring performance. This would require a review of the indicators, targets and their means of verification reported in the project results framework, and recheck assumptions and risks. A detailed schedule of project review meetings and related M&E requirements and reporting activities, including the scheduling of the mid-term and final evaluation, will also be developed during the IW. Subsequent meetings of the PSC will be planned and scheduled, too. The first PSC meeting should be held within the first 12 months following the IW. During the IW, the project related administrative and financial requirements and procedures will be reviewed and agreed. The IW will also provide the opportunity to discuss and agree on the strategy for the dissemination of project results and other strategies related to the project such as the gender and the socioeconomic strategies. As an overall objective, the meeting will provide an opportunity to all partners to better understand and assimilate the goals and objectives of the project and take ownership of the project. The Project Manager will draft the Inception Report within a month from the meeting. The draft will be circulated for comments by project partners, cleared by UNIDO and approved by the PSC.

Annual monitoring and evaluation

An annual meeting for the review of project progress and the planning of activities for the coming year will be organized by the PMU with the participation of executing partners before the annual meeting of the Project Steering Committee. Input to the annual PIR will be provided by the Project Manager, UNIDO and all project partners. The Project Manager will ensure that all relevant input will be provided timely and well in advance of the submission deadline.

Periodic monitoring.

Periodic monitoring will be performed through site visits at the project demonstration facilities by UNIDO, DPIM, ISIT, PMU and other members of the PSC wishing to join these visits. These site visits will be aimed at assessing project progress based on the agreed schedule in the project's Inception Report/Annual Work Plan. A Field Visit Report will be prepared by the PMU and will be circulated no less than one month after the visit to the project team and PSC members.

Terminal Project Workshop

During the last three months, the project management unit will prepare the Project Terminal Report (PTR), which will be the last PIR. It will be a comprehensive report summarizing the results achieved, areas where results may not have been achieved and lessons learned. The Project Terminal Report and the final evaluation (FE) report will form the final project documentation package to be discussed with the PSC during the Terminal Project Workshop.

The Terminal Project Workshop will be held in the last month of project implementation. The TPW will be aimed at assessing the implementation of the project as a whole and if it has achieved its stated objectives and contributed to the broader environmental objective. Particular focus will be given to lesson learned and opportunity for sustainability and replicability of the project's results.

155. Reportorial Requirements

Regular reporting of the achievement of the project objectives and activities forms part of the monitoring and evaluation process. During project lifetime, the project team in conjunction with the PSC members and UNIDO will prepare and submit the following reports:

Inception Report (IR)

A Project Inception Report (IR) will be prepared at the beginning of project implementation and immediately following the Project Inception Workshop (PIW). It will include: (i) a description of the institutional roles, responsibilities, coordinating actions and feedback mechanisms of project-related partners; (ii) finalization of project design and approval of the overall work-plan, including related Monitoring and Evaluation activities; (iii) a timeframe of project review meetings for PSC and others project's decision-making structures and/or coordination mechanisms; (iv) a detailed Annual Work Plan (AWP) for the activities of the first year of the project; (v) a fine-tuning of verifiable indicators and corresponding means of verification to effectively measure project performance during the targeted 12-month timeframe of the AWP; (vi) Terms of Reference (TOR) for effective coordination of the activities and for sub-contractual services and project consultants; (vii) a detailed project budget for the first year of implementation, prepared on the basis of the AWP. When finalized, the report will be circulated to project counterparts who will be given a period of one calendar month in which to respond with comments or queries. Prior to this circulation of the IR, UNIDO will review the document.

Project Implementation Report (PIR)

The Project Implementation Report (PIR) is an annual management and monitoring process. It is an essential monitoring tool for project managers and offers the main vehicle for extracting lessons from ongoing projects. Once the project will be under implementation for a year, the project team shall complete the PIR. The annual PIR is the main tool used by the GEF for monitoring its portfolio and reviews financial status, procurement data, impact achievement and progress in implementation. Final PIR will be submitted to GEF as per standard procedures.

Project Terminal Report

The Project Terminal Report (PTR) will be the definitive statement of the Project's achievements. This comprehensive report will be the overall evaluation of the project and will summarize all activities, outputs and outcomes of the Project, objectives met (or not met), structures and systems implemented, etc., paying particular attention to whether the project has achieved its immediate objectives and contributed to the global environmental objective. It will also serve as a source of lessons learned and will lay out recommendations for follow-up activities that may need to be taken to ensure sustainability and replicability of the Project's activities. The project team will prepare the PTR during the last three months of the project lifetime. It shall be prepared in draft sufficiently in advance to allow review and technical clearance prior to the final PSC meeting.

Thematic Reports

As and when called for by UNIDO, the project team will prepare specific Thematic Reports, focusing on specific issues or areas of activity. The request for a Thematic Report will be provided to the project team in written form by UNIDO and will clearly state the issue or activities that need to be reported on. These reports will be used as a form of lessons learned exercise, specific oversight in key areas, or as troubleshooting exercises to evaluate and overcome obstacles and difficulties encountered.

Technical Reports

Technical Reports are detailed, comprehensive documents covering specific areas of research within the framework of the overall project. The key areas where Technical Reports are expected to be prepared during the course of the Project will be individuated during the Project Inception Workshop and during annual PSC meetings. Technical Reports may also be prepared by external consultants and will be used as working documents for the Project implementation as well as to disseminate relevant information at local, national and international levels.

156. Project Publications

Project Publications in the form of articles in academic and peer-reviewed journals, multimedia publications, informational texts or other forms of distribution, will represent a method for a widely dissemination of relevant results and achievements of the Project. Publications can be based on Technical Reports, or may be summaries or compilations of a series of Technical Reports and other research. The project team will determine if Technical Reports merit formal publication, and will also (in consultation with UNIDO, the governments and other relevant stakeholder groups) plan and produce these Publications in a consistent and recognizable format. Publications setting out methodologies adopted in this project, achieved results and lessons learnt will be distributed to the industry, governments, Parties to the Convention. Any publication will observe UNIDO and GEF advocacy guidelines.

157. Independent Evaluations

Midterm Evaluation

The project will be subjected to two independent external evaluations: a Mid-term Evaluation and a Final Evaluation. The mid-term evaluation (MTE) will be undertaken at mid-term (between the second and third year of project implementation) by an independent consultant to review the progress of each project activity and assess effectiveness of implementation according to the project's indicators presented in the Project Results Framework. The Terms of Reference for this mid-term evaluation will be prepared by UNIDO in accordance with the generic TORs developed by the its Independent Evaluation Division.

The MTE will review the effectiveness, efficacy and timelessness of project execution, evaluate the effectiveness of the Partnership composition and of the interaction between partners, identify potential issues which could prevent optimal development of the project. This assessment will be extended to the administrative aspects and will also consider the provision of financial resources and co-financing provided by the project partners, The MTE findings could propose recommendations and remedial actions to be incorporated as improvement in the implementation strategy and execution for the remainder of the project's duration, if necessary. This evaluation will also highlight initial technical achievements, achievement of GEBs and lessons learned derived from project implementation. The final MTE report will be reviewed by UNIDO and approved by the PSC.

Final Evaluation

The final evaluation (FE) will begin three months before the completion of the project and after the end of the main planned project activities. This will allow the independent consultant to carry out the evaluation when major activities are already completed but with the project team still in charge. The final evaluation will focus on the same issues as the mid-term evaluation. However, since all the planned project activities set-out in the Project Results Framework will be completed at the start of the evaluation, a greater focus on identifying and extracting project impacts including the contribution in building local capacity, the achievement of global environmental goals, lesson learned, sustainability and replicability of project results will be reserved. This evaluation will be performed on the basis of the delivery of the project's results as initially planned, eventually as corrected after the mid-term evaluation, if any such correction took place. The FE will also provide recommendations on how to disseminate products and outputs of the project most efficiently within and outside the country. The Terms of Reference for this evaluation will be prepared by UNIDO in accordance with the generic TORs developed by its Independent Evaluation Division. The PMU and other stakeholders will be involved and consulted during the terminal evaluation process. The final TE report will be cleared by UNIDO and approved by the PSC.

The Monitoring and Evaluation (M&E) Work Plan and Estimated Associated Budget are presented in **Table 10** below:

Table 10: Monitoring and evaluation budget

M&E activity	Responsible Parties	Indicative costs to be charged to the Project budget (USD)		Timeframe
		GEF grant	Co-financing	
Design and implementation of M&E system	PMU in consultation with other project partners	0	25,000	Within the first six months
Monitoring indicators and project progress	PMU, local and international consultants as needed	20,000	100,000	Regularly, with an annual review prior to the finalization of APR/PIR
Visits to demo sites to monitor progress and assess delivery of services	PMU, local and international consultants as needed	60,000	300,000	As required, minimum once a year.
Annual Project	PMU, local and	20,000	100,000	Annually

Reporting	international consultants as needed			
Annual work-plans on planned project activities and outputs	PMU in consultation with other project partners	0	25,000	Annually, on the basis of APR/PIR outputs
Independent mid-term evaluation (external) and management response	UNIDO, PSC, PMU, independent external evaluators.	40,000	150,000	Midpoint of project implementation
Independent final evaluation (external) and management response	UNIDO, PSC, PMU, independent external evaluators.	50,000	200,000	At least two months before end of project
Knowledge management (technical reports, lessons learned, dissemination activities, etc.)	PMU in consultation with other project partners	60,000	600,000	As appropriate
Total indicative cost		250,000	1,500,000	

158. Legal Context

The Kingdom of Thailand agrees to apply to the present project, *mutatis mutandis*, the provisions of the Revised Standard Technical Assistance Agreement concluded between the United Nations and the Specialized Agencies and the Government on 4 June 1960.

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PART III: CERTIFICATION BY GEF PARTNER AGENCY(IES)

A. GEF Agency(ies) certification

This request has been prepared in accordance with GEF policies¹⁰ and procedures and meets the GEF criteria for CEO endorsement under GEF-6.

Agency Coordinator, Agency Name	Signature	Date (MM/dd/yyyy)	Project Contact Person	Telephone	Email Address
Mr. Philippe R. Scholtès, Managing Director, Programme Development and Technical Cooperation UNIDO GEF Focal Point		08/21/2017	Carmela Centeno	+431260263385	c.centeno@ unido.org

¹⁰ GEF policies encompass all managed trust funds, namely: GEFTF, LDCF, SCCF and CBIT
GEF6 CEO Endorsement /Approval Template-August2016

ANNEX A: PROJECT RESULTS FRAMEWORK (either copy and paste here the framework from the Agency document, or provide reference to the page in the project document where the framework could be found).

Project: Greening the scrap metal value chain through Promotion of BAT/BEP to Reduce U-POPs Releases from Recycling Facilities					
Objective	Indicators	Baseline	Targets End of Project	Sources of verification	Assumptions
The main objective of this five-year project is to promote and introduce Best Available Technologies (BAT) and Best Environmental Practices (BEP) in scrap metal recycling facilities to reduce or eliminate the release of unintentionally produced Persistent Organic Pollutants (U-POPs)	Quantified reduction in U-POPs released by the industrial sector expressed in g TEQ/year of PCDD/F reduced at the pilot demonstration sites.	<p>Nationwide, PCDD/F released by the metallurgical industry are estimated to be 119.84 g-TEQ/year (2004).</p> <p>No regulatory instrument has been issued specific for the ferrous and non-ferrous secondary metal production industry relevant to UPOPs emission.</p> <p>The four demonstration facilities still lack validated information about U-POPs emissions. The estimated releases at the four demonstration sites is 59.1 g TEQ/year.</p> <p>No investment is taking place for the implementation of BAT/BEP measures.</p>	<p>Demonstration projects developed and completed in four (4) pilot facilities with reduction of U-POPs measured for each pilot facility.</p> <p>Emission standards for UPOPs emission for ferrous and non-ferrous secondary metal production formulated and enforced.</p> <p>Estimated 23 g-TEQ/year of PCDD/F releases prevented from the four pilot demonstration sites and projected over the 15 year lifetime of installed equipment</p> <p>BAT/BEP measures demonstrated and available.</p>	<p>Field visits reports.</p> <p>Specific reports and technical documentation on BAT/BEP implemented for each pilot facility.</p> <p>Sampling and analytical reports on U-POPs measurements for each pilot facility.</p> <p>Project’s annual reports.</p> <p>Project mid-term and terminal evaluation reports.</p>	<p>Continuous international support.</p> <p>Continuous political support from key national institutions.</p> <p>Commitments of the private sector in ensuring the large co-financing for BAT/BEP implementation to decrease U-POPs releases in their processes.</p> <p>Strong cooperation between government institutions and private sector.</p>

Component 1. Policy and regulatory framework					
Outcome 1: Policy and regulatory framework strengthened and enhanced for the implementation of a sound management of metal recycling in compliance with the Stockholm Convention requirements.	Number of regulatory instruments, national guidelines and technical manuals based on BAT/BEP adopted and/or enforced national authorities.	Insufficient policy and regulatory framework to encourage the diffusion of BAT/BEP for the reduction of U-POPs emissions from the scrap metal recycling chain.	One (1) new set of revised laws and regulations adopted promoting the diffusion of BAT/BEP to reduce U-POPs releases from the secondary metals producing industry drafted.	Plan of the proposed revision of strategies and national legislation for the reduction of U-POPs releases.	The establishment of a regulatory environment for the implementation of BAT/BEP in the management of the scrap metal value chain remains a top priority for the national government.
Output 1.1: One (1) database capturing various aspects of the metal recycling chain, as a new tool for policy makers, compiled.	<p>Number of facilities identified/surveyed.</p> <p>Number of main industrial stakeholders interviewed/consulted.</p> <p>Survey data entered and validated in the database.</p> <p>Availability of the database as a new tool for policy makers.</p> <p>Number of beneficiary institutional stakeholders.</p>	<p>There is no comprehensive picture of the facilities involved in the scrap metal value chain. Data are scattered among different ministries/departments and industry associations</p> <p>There is no comprehensive database for the scrap metal value chain available in the country at the present time.</p>	<p>At least 50% of the firms in the national scrap metal value chain fully assessed.</p> <p>At least 2 representative companies in the steel and aluminium value chain interviewed/ consulted.</p> <p>A comprehensive database developed and functional.</p>	<p>Specific report on the assessment.</p> <p>Specific report on database development.</p> <p>Project's annual reports.</p> <p>Project mid-term and terminal evaluation reports.</p>	<p>Continuous cooperation between Government entities and private sector.</p> <p>Strong cooperation between all interested stakeholders.</p> <p>Scrap producers, scrap recyclers and scrap consumers are willing to share information related to their businesses.</p>
Output 1.2: Specific guidelines on environment, health and safety measures in the metal recycling chain value developed.	<p>Number of available national guidelines and technical manuals on BAT/BEP.</p> <p>Number of training programmes developed for staff authorities</p>	<p>There is insufficient knowledge about U-POPs and BAT/BEP in the metal recycling chain.</p> <p>There is insufficient information system which provide insight to operators for the management of scrap metal.</p>	<p>National guidelines and technical manuals drafted in coordination between governmental and industrial stakeholders and adopted.</p> <p>50 national authority staff trained on measures and technologies to reduce U-POPs releases from the metallurgical industry.</p>	Guidelines and technical manuals finalized and available for consultations.	All stakeholders are interested to define the technical aspects to be considered for scrap metal management and to know how BAT/BEP implementation in the metal scrap value chain could be applied.

			Equal access to training for men and women ensured.		
Output 1.3: Improved and harmonized national policies and regulations for environmental and health protection from metal recovery activities.	Number of regulatory instruments, national guidelines and technical manuals based on BAT/BEP submitted and/or undergoing adoption by national authorities.	Insufficient policy and regulatory framework to encourage the diffusion of BAT/BEP for the reduction of U-POPs emissions from the scrap metal recycling chain.	New set of revised laws and regulations promoting the diffusion of BAT/BEP to reduce U-POPs releases from the secondary metals producing industry.	Plan of the proposed revision of strategies and national legislation for the reduction of U-POPs releases.	The establishment of a regulatory environment for the implementation of BAT/BEP in the management of the scrap metal value chain remains a top priority for the national government.
Component 2. Information dissemination and capacity building					
Outcome 2.1: Increased awareness on U-POPs and BAT/BEP concepts by relevant stakeholders	Institutionalized awareness programs within relevant ministries/institutions. campaigns.	Awareness programs on U-POPs and scrap metal recycling related issues (environmental impacts, sound management, etc.) not included in regular programs.	Number of institutions adopting/institutionalizing awareness programs that include U-POPs and BAT/BEP as topics.	Awareness raising materials and awareness raising report including feedback assessment.	Cooperation of training institutions in participating to the awareness raising activities.
Outcome 2.2: Improved national capacity in the sound management of the recycling chain of pre-consumer and post-consumer scrap metal	Number of people (male/female) trained on the sound management of the recycling chain of scrap metal and on BAT/BEP. Availability of training reports.	Insufficient knowledge, experience and technical capability of industry manager and technical staff on BAT/BEP for the reduction of U-POPs releases in the metal scrap recycling sector.	Industry managers and technical staff are trained on the technical and environmental aspect for a sound management of the recycling of scrap metal. Training on sound scrap metal management and BAT/BEP delivered to at least 100 trainees. Equal access to training for men and women ensured. At least 20% women.	Training material. Training reports, including post-training assessment through questionnaire surveys.	A large number of metal scrap recyclers is interested in attending trainings. Training of operators is effective so that the promotion and introduction of BAT/BEP will be sustained during and after project end.
Output 2.1: Awareness raising materials and awareness raising	Development of awareness programs and materials.	Limited environmental and health awareness on scrap metal recycling and	Development of at least 1 video material and 2 relevant publication on	Awareness raising materials.	Cooperation of training institutions in participating to the

workshop developed and implemented.	<p>Number of awareness raising initiatives.</p> <p>Number of participants (male/female) in the awareness raising campaigns.</p>	U-POPs issues in both the users and the general public.	<p>the issue of dioxin and BAT and BEP</p> <p>At least 2 awareness raising campaigns conducted for the users of scrap metal and the general public.</p> <p>At least 2 participants from the relevant stakeholders identified in the document participating in awareness raising campaigns. Equal access to training for men and women ensured.</p>	Awareness raising reports including feedback assessment.	awareness raising activities.
Output 2.2: Technicians and operators of the scrap metal sector are trained on BAT/BEP.	<p>Number of institutions involved in setting up training materials and providing training sessions.</p> <p>Number of people (male/female) trained on BAT/BEP.</p> <p>Number of participants (male/female) to the Study Tour.</p> <p>Number of company visited and speeches held during the Study Tour.</p> <p>Availability of training reports.</p>	<p>Training materials for a sound management of scrap metal recycling is not available.</p> <p>Limited knowledge and limited technical capacity among collectors, recyclers and users of scrap metal on BAT/BEP applicable to the scrap metal recycling chain.</p>	Training on sound scrap metal management and BAT/BEP delivered to at least 100 trainees. Equal access to training for men and women ensured.	<p>Training materials.</p> <p>Training assessment reports delivered.</p> <p>Study Tour report.</p>	<p>Cooperation of training institutions in participating to the training activities.</p> <p>Training of operators is effective so that the promotion and introduction of BAT/BEP will be sustained during and after project end.</p>
Component 3. Pilot project for the demonstration of BAT/BEP in selected metal recycling facilities.					
Outcome 3. State-of-the-art primary and secondary measures for	BAT/BEP measures adopted by the metallurgical sector	The absence of specific emission limits and/or institutional incentive	Demonstration project interventions/results adopted by the	Reports on deployment of BAT/BEP to other facilities	The technologies to be implemented are accessible to all facilities

U-POPs release reduction in selected facilities identified and deployed.		systems makes that BAT/BEP are not implemented.	metallurgical industry.		
Output 3.1. BAT/BEP measures identified and implemented for scrap collectors and scrap consumers	<p>Number of BAT/BEP identified, implemented and demonstrated.</p> <p>Amount of incremental investment made.</p> <p>Quantity of PCDD/F and other pollutant releases avoided, reduced or eliminated.</p> <p>Number of documents produced for each pilot case.</p>	BAT/BEP measures in thermal processes of the metallurgical industry have never been demonstrated in Thailand.	<p>Demonstrations and assessments of the BAT/BEP measure agreed with 4 enterprises carried out and completed at the selected pilot sites.</p> <p>Not less than 23 g-TEQ/year releases reduction by BAT/BEP introduction in the demonstration facilities.</p> <p>Incremental investment in USD reported.</p>	<p>Site visits and mission reports.</p> <p>Reports confirming that all implemented BAT/BEP are operational.</p> <p>BAT/BEP assessment report for each demonstration facility.</p> <p>Evaluation of pilot projects undertaken.</p> <p>Reports on monitoring campaigns and assessment of U-POPs releases.</p>	<p>Continuous support from the private sector despite the high costs associated with demonstration of BAT/BEP.</p> <p>The managers and the technical staff have good technical capacity to handle the BAT/BEP implementation and operations.</p> <p>Sampling and analysis of U-POPs releases will generate reliable results.</p>
Output 3.2. Training of local stakeholders (government staff, SMEs, scrap collectors, etc.) and technical staff in the management of BAT/BEP undertaken	<p>Number of people (male/female) trained on BAT/BEP.</p> <p>Availability of training reports.</p>	Insufficient knowledge, experience and technical capability of industry manager and technical staff on BAT/BEP for the reduction of U-POPs releases in the metal scrap recycling sector.	Training of at least 50 technical professionals on BAT/BEP applicable to the industrial sector. Equal access to training for men and women ensured.	<p>Training materials and training attendance sheets.</p> <p>Report demonstrating that training was successfully delivered.</p>	Training of operators is effective so that the promotion and introduction of BAT/BEP will be sustained during and after project end.
Output 3.3. Results of the implemented demonstration projects published and disseminated for replication through collaboration with	<p>Number of documents drafted and disseminated.</p> <p>National action plan for replication developed and approved.</p>	Currently there is no action plan for replication.	A national action plan including estimates of costs and benefits to the adoption of BAT/BEP finalized and endorsed.	The action plan document.	<p>Continuous cooperation between Government entities and private sector.</p> <p>Managers of demonstration sites</p>

existing financial institutions in the country.					committed to share experiences.
Component 4. Monitoring and evaluation; knowledge management and dissemination					
Outcome 4. Effective monitoring and evaluation of project impact and sustainability implemented.	Existence of project management structure; timely availability of reports	New staff dedicated to the project and most of the key stakeholders will require specific training on the UNIDO and GEF M&E procedures.	M&E activities implemented and project implementation monitored and evaluated to achieve project objectives	Various M&E and substantial reports, progress, annual and terminal reports, Mid-Term Review and Terminal Evaluation reports.	Efficient M&E to facilitate timely achievement of project outcomes and objectives
Output 4.1. Project M&E designed and implemented.	<p>Timely project implementation.</p> <p>M&E adequately conducted according to UNIDO and GEF standard.</p> <p>Timely availability of inception, annual (APRs, PIRs, AWP) and evaluation (mid-term and final) project reports.</p> <p>Documentary evidence of M&E activities including but not limited to drafting TORs, selection and recruitment consultants and staff, review of substantial report.</p>	<p>Indicative Project Results Framework with outcome and output indicators and targets.</p> <p>Indicative M&E plan, budget and timeframe.</p> <p>New staff dedicated to the project and most of the key stakeholders will require specific training on the UNIDO and GEF M&E procedures.</p>	<p>Inception workshop held within one month from project approval.</p> <p>Project management structure implemented and fully functional within 6-months from the approval of the project</p> <p>Training on monitoring procedures, including gender, and administrative processes held during Inception Workshop.</p> <p>Mid-term evaluation delivered within 3 years from project signature.</p> <p>Terminal evaluation report delivered within 3 months from project closure.</p>	<p>Project inception workshop report.</p> <p>Annual Project Implementation Reports (PIRs).</p> <p>Project Annual Work Plans (AWPs)</p> <p>Annual Progress Reports (APRs)</p> <p>Independent Mid-term Evaluation report.</p> <p>Independent Terminal Evaluation report</p> <p>Terminal report</p>	<p>All the relevant project stakeholders are willing to cooperate in the timely establishment of project management structures.</p> <p>M&E and project reporting mechanisms agreed and adopted by all the relevant project partners.</p> <p>Project stakeholders actively cooperating in all M&E activities.</p> <p>Indicators are comprehensive and designed to be properly measured.</p> <p>All deliverables are submitted in time.</p>
Output 4.2 Lessons learnt disseminated	Number of communication materials and	None	Lessons and experience documented and disseminated in at least 2	Knowledge products disseminated (newsletters, brochures,	Government and key stakeholders are willing to share data and

	dissemination events conducted.		workshops/conferences.	peer-reviewed publication(s), etc.)	information.
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ANNEX B: RESPONSES TO PROJECT REVIEWS (from GEF Secretariat and GEF Agencies, and Responses to Comments from Council at work program inclusion and the Convention Secretariat and STAP at PIF).

A. STAP comments at PIF on March 2016 Work Program

STAP welcomes the proposed project which seeks to promote and introduce BAT/BEP measures in scrap metal recycling facilities in order to reduce or eliminate uPOPs releases.

This project should be able to make an important contribution to learning and knowledge as at its core it aims to identify, implement and demonstrate state-of-the-art technologies for reducing uPOPs releases from scrap metal recycling (including upstream processes such as decontamination of scrap before processing, and consideration of handling of residues), with good consideration of technical viability, replication, economic sustainability and cost-effectiveness. There is a huge potential to contribute with more accurate figures of emissions of uPOPs from the recycling sector.

<i>Comments</i>	<i>Response</i>
STAP urges the proponent to generate appropriate knowledge products from this initiative to ensure effective feed back into future GEF interventions in this area.	The project proponents duly note the STAP comment and has put emphasis on the generation and dissemination of lessons learned and knowledge products from this project. Please refer to Section A.8 on knowledge management.

B. Council Members' comments (Germany)

<i>Comments</i>	<i>Response</i>
Component 2: Since the project will support the implementation of a well-organized scrap metal recycling chain, the project proposal would benefit from stating the in-depth assessment as well as further activity steps more accurately. Also, the indicated risk mitigation strategy to involve stakeholders should be described more precisely.	During the PPG phase, it appeared clear that the point of Component 2 originally referred to as Output 2.3, “Scrap metal value chain assessed and interventions identified”, would have been one of the preliminary points of Component 1 and in the absence of which it would have been difficult to implement other activities of this component. Moreover, it appears also clear that it would be very useful if the updated and in-depth information of the sector collected during the survey and interviews to operators would be integrated into a centralized database available to policy makers. Currently, available information are scattered among several ministries and industry associations. Consequently, a new Output (now Output 1.1) has been added in Component 1 of the Request for CEO Endorsement named “One (1) database capturing various aspects of the metal recycling chain, as a new tool for policy makers, compiled”, which integrates the previous Output 2.3 and the development and compilation of the database. Therefore, the initial activities that will performed during the project implementation will consist of an in-depth survey of the scrap metal value chain in Thailand to collect updated and in-depth information of the sector, including generators, collectors and consumers of scrap metal (Activity 1.1). All the aspects emerging during the survey and in-depth interviews to operators will be entered and validated into a

	<p>database in order to provide a new tool for policy maker (These activities will be monitored and evaluated through several Output Indicators (Number of facilities identified/surveyed, Number of main industrial stakeholders interviewed/consulted, Number of beneficiary institutional stakeholders) as reported in the Project Results Framework.</p> <p>The risk mitigation strategy to involve stakeholders (scrap recyclers, smelter facilities and other stakeholders) has been described in the Risk Matrix (Table 9), which describe mitigation strategies adopted so far and those that will be implemented during the development of the project. Specifically, these include identifying and involving stakeholders in the early stages of the project's implementation, their involvement in capacity building and awareness-raising activities, the identification of potential conflicting interests, and the assessment of training needs. Finally, the project will ensure the co-operation of the involved stakeholders via regular communication and outreach. These identified risks will be monitored during the project implementation and further countermeasures will be adopted ,if needed.</p>
<p>Germany strongly recommends to describe in detail what kind of industry associations, NGOs, academic and research institutions will be involved in the implementation of the project and to designate the principle stakeholders.</p>	<p>Considering the objectives of the project, industrial partners represent the main stakeholders in the project. This is reflected in the participation of the Iron and Steel Institute of Thailand (ISIT) as a project's executive partner in the role of co-ordination among other institutional partners and the private sector represented by four leading metallurgical industries in Thailand, which participates as demonstration facility in the project.</p> <p>Beside industrial partners, key stakeholders include other industry associations, academic and research institutions, civil society organizations and local communities. The general public is also an important actor in the scrap metal value chain in that, as a consumer, is involved in the disposal channels of end-of-life products.</p> <p>During the project inception meeting and the PPG development, several potential key stakeholders were identified. Many of them expressed their interest in the project and presented their potential for participation in the project. A list of institutions/associations that could be involved in the implementation of the project, their area of expertise and their potential role in the project is included in Section A.3, Stakeholders, of the GEF-6 Request for Project Endorsement/Approval document.</p> <p>The project team will keep channels of communication open</p>

	with these institutions/associations and will engage relevant members of this network to project activities during the implementation phase of the project.
As the alignment with National Priorities is described as fully consistent, the corresponding check box should be marked.	This is duly noted.

ANNEX C: STATUS OF IMPLEMENTATION OF PROJECT PREPARATION ACTIVITIES AND THE USE OF FUNDS¹¹

A. Provide detailed funding amount of the PPG activities financing status in the table below:

PPG Grant Approved at PIF: USD 150,000			
<i>Project Preparation Activities Implemented</i>	<i>GETF/LDCF/SCCF/CBIT Amount (\$)</i>		
	<i>Budgeted Amount</i>	<i>Amount Spent To date</i>	<i>Amount Committed</i>
Meetings and workshops (inception meeting, focus group discussions, coordination meeting, consultative workshops, validation workshops)	15,000	12,500	2,500
Baseline data collection and analysis (visit to facilities, preliminary dioxin analysis and experts' mission) □	100,000	72,200	12,800
Preparation of environmental and social management framework and gender study	15,000	10,200	4,800
Development of the logical framework and project document	20,000	15,000	5,000
Total	150,000	109,900	40,100

The PPG activities undertaken have resulted to the achievement of the objectives set in the project preparation phase. Concrete results were achieved through various meetings and workshops held with the relevant stakeholders and the studies undertaken by national experts on various baseline information required, including environmental and social plans and gender analysis, to complete the project document. Expert missions were also undertaken to analyze the gaps and barriers that need to be highlighted and the project activities that would define the incremental funding. Preliminary analysis of dioxin emissions from the facilities was also conducted. Engagement of various stakeholders were sought in various meetings and focus group discussions. A TWG was also formed, under the leadership of DPIM, to decide on relevant issues arising from the preparatory work.

The detailed PPG activities are as follows:

A. Workshops

Date	Name	Objectives	Outputs
24 August 2016	National Stakeholder Consultation on Greening the scrap metal value chain through Promotion of BAT/BEP to Reduce U-POPs Releases from Recycling Facilities Project	Project dissemination, networking, and consultation with national government, academic and research institutions,	A good response from the relevant stakeholders with their possible contributions to the project along with their recent information and experience as well as the upcoming projects/activities which will be in line with the project implementation
26	Stakeholder Inception	Project dissemination,	Private sector requirement

¹¹ If at CEO Endorsement, the PPG activities have not been completed and there is a balance of unspent fund, Agencies can continue to undertake the activities up to one year of project start. No later than one year from start of project implementation, Agencies should report this table to the GEF Secretariat on the completion of PPG activities and the amount spent for the activities. Agencies should also report closing of PPG to Trustee in its Quarterly Report.

Date	Name	Objectives	Outputs
August 2016	Meeting in Rayong on Greening the scrap metal value chain through Promotion of BAT/BEP to Reduce U-POPs Releases from Recycling Facilities Project	networking, and consultation with local government institutions, mainly ferrous scrap recycling facilities and their counterpart.	and motivation.
5 April 2017	Partnership Meeting Greening the scrap metal value chain through Promotion of BAT/BEP to Reduce U-POPs Releases from Recycling Facilities Project	To identify the roles and responsibilities of the project partners To specify the co-financing items, and to clarify the issues that the partners may have with their participation to the project.	Project information, relevant details to the application procedure and project timeline was explained and discussed with the prospective project partners.

2. Missions and Consultative Meetings

Date	Name	objectives	outputs
5 August 2016 9 September 2016 21 October 2016	Department of Primary Industries and Mines (DPIM)	Project consultation	Progress of data collection and assessment, updating information for PPG development
23 November 2016		Kick off Meeting of the Task Force Group of DPIM	
7 March 2017		2017 First Meeting of the Task Force Group of DPIM	
3 April 2017		2017 Second Meeting of the Task Force Group of DPIM	
28 April 2017		2017 Third Meeting of the Task Force Group of DPIM	
18 May 2017		2017 Fourth Meeting of the Task Force Group of DPIM	
23 May 2017		Project consultation	
24 November 2016	Pollution Control Department under Ministry of Natural Resources and Environment (MONRE)	Project consultation	Networking with Director of Air Quality and Noise Management Bureau and Director of Industrial Emission Division
4 May 2017		Project consultation	20 Years Policy on Pollution Management and Pollution Management Plan (2017 -2021)

Date	Name	objectives	outputs
14 November 2016 6 March 2017	National Dioxin Institute under the Department of Environmental Quality Promotion (DEQP), MONRE	Potential assessment, project dissemination, networking, and consultation	Networking with Director of National Dioxin Institute and laboratory quality management Information about dioxin in environment monitoring in Thailand, particularly the research work
22 March 2017	Regional Environmental Office 13 (Chonburi), under MONRE	Project dissemination and networking	Networking with Regional Environmental Office 13 (Chonburi)
4 August 2016	Environmental Policy and Planning Provincial office in Rayong under MONRE	Project dissemination and networking	Networking with Director of Environmental Policy and Planning Provincial office in Rayong
15 November 2016 2 February 2017 9 March 2017	Iron and Steel Institute of Thailand (ISIT) under Ministry of Industry	Project dissemination and networking Consultation Consultation	Company profile Progress of contract signing with UNIDO Thailand Steel Outlook 2017
13 October 2016 9 March 2017	UAE-IDEA Advance Analytical Company Limited (UIA)	Potential assessment of the company and networking Assessment the only private dioxin laboratory in Thailand	Company profile, project dissemination and connection Japanese expert on dioxin management policy Laboratory quality management and updating information of other Thai dioxin laboratories
14 November 2016	Regional Resource Centre for Asia and the Pacific (RRCAP at AIT).	Project dissemination and Networking	Networking with the former Director of Dioxin Division, Ministry of Environment, Japan
7 February 2017	Thai Metal Co., Ltd.	Project dissemination, networking, and consultation	Co-financing letter
4 August 2016	The Siam Construction Steel Co., Ltd., A subsidiary of TATA STEEL (THAILAND)	Project dissemination, networking, and consultation	Company profile and production process information
8 February 2017	Hitachi Automotive System Asia	Project dissemination, networking, and consultation	Company profile and production process information

Date	Name	objectives	outputs
24 August 2016 9 February 2017	Xin Ke Yuan Co. Ltd.	Project consultation	Company updated profile
10 February 2017	N.T.S. Steel Group PCL	Project dissemination, networking, and consultation	Co-financing letter
7 - 8 March 2017	The Bangkok Iron and Steel Works Co., Ltd	Project dissemination, networking, and consultation	Co-financing letter
22 March 2017	Daiki Aluminium Industry Thailand Co., Ltd.	Project dissemination, networking, and consultation	Co-financing letter
21 March 2017	Office of Natural Resources and Environment Policy and Planning (ONEP)	Project dissemination, networking, and consultation	Environmental Management Master Plan of Thailand (2017- 2021) including the policy framework and Flagship projects to achieve SDGs, particularly Goal 12

3. Baseline Assessment and related studies (Engagement of experts)

Expert	Services	Outputs
ENEA, Italy	Conduct assessment of the facilities and provide international expertise on the sector. Drafting of the project document	Preliminary assessment of pilot facilities and draft project document
Iron and Steel Institute of Thailand (ISIT)	Comprehensive overview of the metal scrap (iron and steel, aluminum) recycling industry in Thailand. Review and assess BAT/BEP guideline in metal scrap (iron and steel, aluminum) appropriated with recycling facilities in Thailand in order to reduce emission and improve efficiency. Negotiate with owner of metal recycling facilities be within the terms and conditions of the project requirement.	The up to date information of policy and regulatory framework of environmental management related to dioxins/furans. The up to date information of the metal scrap (iron and steel, aluminum) recycling industry in Thailand. Assessment of BAT/BEP for metal scrap (iron and steel, aluminum) recycling facilities in Thailand Four ferrous and non- ferrous recycling facilities, from 2 provinces were selected;

		<p>1. Samutraparkarn</p> <ul style="list-style-type: none"> - The Bangkok Iron and Steel Works Co., Ltd. - Thai Metal Aluminum Co., Ltd. <p>2. Chonburi</p> <ul style="list-style-type: none"> - N.T.S. Steel Group Public Co., Ltd., A subsidiary of TATA STEEL (THAILAND) - Daiki Aluminum Industry (Thailand) Co., Ltd.
Department of Environmental Quality Promotion (DEQP)	Baseline data of environmental quality in the two provinces.	Dioxin level in ambient air of the selected area.
UAE-IDEA Advance Analytical Company Limited (UIA)	Baseline data of emission from the facilities	Concentration of dioxin in stack sampling from three facilities
Dr. Ruttiya Bhula-or College of Population Studies, Chulalongkorn University	Gender analysis report including Baseline Study and Summary of Findings of Ferrous and non-Ferrous metal industry assessment that associated with ISIT consultation process.	Gender analysis of the metallurgical sector in Thailand.

4. Setting up of the Task Force Group (TFG)

The Director - General of Department of Primary Industries and Mines (DPIM) issued Order No.284 /2559 dated 28 October B.E.2559 (2016) to set up the Task Force Group of DPIM to develop information for the formulation of the project document during the PPG phase. Their roles and responsibilities are TOR development and supervision of services and work related to the information required to develop the full project document.

The members of the TFG are the following:

- | | | |
|----------------------------------|---|-------------|
| 1. Mr. Sakol Anunwanitcha | Director of Bureau of Primary Industries, DPIM | Chair |
| 2. Mr. Kittiphan Bangyikhan | Professional Engineer, DPIM | |
| 3. Mr. Sorawids Chailertwanitkul | Professional Policy and Plan Analyst and National Program Offices (NPO) from Ministry of Industry | |
| 4. Ms. Kanjana Suaysom | Representative of Air Quality and Noise Management Bureau, Pollution Control Department (PCD) | |
| 5. Ms. Warawan Chalermot | National Expert on POPs, UNIDO | Secretariat |

ANNEX D: CALENDAR OF EXPECTED REFLOWS (if non-grant instrument is used)

Provide a calendar of expected reflows to the GEF/LDCF/SCCF/CBIT Trust Funds or to your Agency (and/or revolving fund that will be set up)

ANNEX E. TIMELINE OF ACTIVITIES

Component 1: Policy and regulatory framework																				
Expected Outcome/Output/Activity	Year 1				Year 2				Year 3				Year 4				Year 5			
	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4
Outcome 1: Policy and regulatory framework strengthened and enhanced for the implementation of a sound management of metal recycling in compliance with the Stockholm Convention requirements.																				
Output 1.1: One (1) database capturing various aspects of the metal recycling chain, as a new tool for policy makers, compiled.																				
Activity 1.1: improved survey of the scrap metal value chain in Thailand to collect updated and in-depth information of the sector, including generators, collectors and consumers of scrap metal.																				
Activity 1.2 Development and compilation of a database capturing all the aspects emerged during the survey and in-deep interviews to operators in order to provide a new tool for policy maker;																				
Output 1.2: Specific guidelines on environment, health and safety measures in the metal recycling chain value developed.																				
Activity 1.3: develop training programmes for regulatory authorities, professionals and research institutions on technical measures based on BAT/BEP to prevent generation of U-POPs from the secondary metals producing industry and based on strategies of sustainable production and consumption.																				
Activity 1.4: comprehensive examination of policies, regulations, standards and guidelines developed and applied in other countries related to the scrap metal value chain, including scrap classification, scrap collection, scrap pre-treatment and scrap melting;																				
Activity 1.5: drafting of national technical guidelines and procedure manuals based on BAT/BEP and devoted to a sound management of scrap metals recycling;																				
Output 1.3: Improved and harmonized national policies and regulations for environmental and health protection from metal recovery activities.																				
Activity 1.6: revision of existing laws and regulations, identification of gaps and development of additional regulatory measures to promote the diffusion of BAT/BEP in order to reduce emissions of U-POPs from the secondary metals producing industry;																				
Activity 1.7: organization and conduct of one (1) national workshops both for institutional and technical stakeholders to present, discuss and agree on recommendations for improving the regulatory framework.																				
Activity 1.8: Carry out national consultations with relevant stakeholders to identify economic and financial mechanisms that can support the implementation of BAT and BEP on the basis of the enforced laws and regulations and that could enhance private sector and commercial banks involvement.																				

Component 2. Information dissemination and capacity building																				
Expected Outcome/Output/Activity	Year 1				Year 2				Year 3				Year 4				Year 5			
	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4
Outcome 2.1: Increased awareness on U-POPs and BAT/BEP concepts by relevant stakeholders																				
Output 2.1: Awareness raising materials and awareness raising workshops developed and implemented.																				
Activity 2.1: Plan and schedule a kick-off workshop ensuring the highest coverage by the public authorities, the private sector and NGOs to secure the largest national knowledge and consensus about the starting project.																				
Activity 2.2 Develop and carry out an awareness raising programs for the general public and the workers on issues related to POPs, on environment and health issues of scrap metals recycling and how to reduce the risk of exposure of women and infants.																				
Outcome 2.2: Improved national capacity in the sound management of the recycling chain of scrap metal.																				
Output 2.2: Technicians and operators of the scrap metal sector are trained on BAT/BEP.																				
Activity 2.3: Provide for a study tour in Western countries to examine possible alternative technologies in operation.																				
Activity 2.4: Develop training materials such as training modules, slide presentations, videos, CDs, etc.																				
Activity 2.5 Develop and carry out targeted training for recycling associations and SMEs aimed to introduce BAT/BEP concepts for a sustainable scrap metals management including collection, storage and pre-treatment.																				
Activity 2.6 Develop and carry out targeted training for industry associations and operators of industrial facilities aimed to introduce BAT/BEP concepts on measures, approaches and technologies to reduce U-POPs releases from the secondary metals industry in compliance with the Stockholm Convention.																				
Activity 2.7 Carry out a training programme to operators of the scrap metals sector on how the technical guidelines, the procedure manuals and other tools developed under the project can practically and reasonably be applied in practice.																				
Activity 2.8 Document training programmes delivery and produce training assessment reports. Promote and disseminate knowledge produced.																				
Component 3. Pilot project for the demonstration of BAT/BEP in selected metal recycling facilities.																				
Expected Outcome/Output/Activity	Year 1				Year 2				Year 3				Year 4				Year 5			
	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4
Outcome 3. State-of-the-art primary and secondary measures for U-POPs release reduction in selected facilities identified and deployed.																				
Output 3.1. BAT/BEP measures identified and implemented for scrap collectors and scrap consumers																				
Activity 3.1 Collect detailed technical and environmental data at the selected demonstration facilities and formulate quantifiable impact indicators. Consider socio-economic data and gender dimension under the current practices.																				

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Activity 3.2 Perform preliminary monitoring campaigns for U-POPs and other pollutants of concern released into the environment under the current operating conditions in the selected demonstration facilities.																				
Activity 3.3. Develop and implement a work plan for the introduction of BAT/BEP in the selected demonstration facilities. Consider climate change mitigation/adaptation measures, socio economic implications and gender dimension.																				
Activity 3.4. Implement BAT/BEP in the selected demonstration facilities.																				
Activity 3.5. Perform monitoring campaigns for U-POPs and other pollutants of concern released into the environment after the implementation of BAT/BEP in the selected demonstration facilities.																				
Activity 3.6. Comprehensive assessment of the effects (technical, environmental, socio-economic and other co-benefits) of the implemented BAT/BEP in the selected demonstration facilities on the basis of the formulated impact indicators.																				
Output 3.2. Training of technical staff and other potentially interested local stakeholders (environmental authority, SMEs, scrap collectors, etc.) in the management of BAT/BEP undertaken																				
Activity 3.7. Develop and carry out a training programme for technical staff of the selected demonstration facilities and other potentially interested local stakeholders (i.e. staff of the environmental authority) on the management of BAT/BEP.																				
Output 3.3. Results of the implemented demonstration projects published and disseminated for replication through collaboration with existing financial institutions in the country.																				
Activity 3.8. Publish and disseminate the relevant results of the implemented demonstration projects for replication.																				
Activity 3.9. Explore and develop with existing financial institutions in the country the design of financial schemes to incentivize the replication and the wide diffusion of BAT/BEP.																				
Component 4. Monitoring and evaluation; knowledge management and dissemination																				
Expected Outcome/Output/Activity	Year 1				Year 2				Year 3				Year 4				Year 5			
	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4
Outcome 4. Effective monitoring and evaluation of project impact and sustainability implemented.																				
Output 4.1. Project M&E designed and implemented.																				
Activity 4.1 Establish a Project Steering Committee (PSC).																				
Activity 4.2 Hold a Project Inception Workshop within the first three months of project start and prepare an Inception Report.																				
Activity 4.3 Design and implement the monitoring and evaluation framework including the definition of impact indicators and the design of a detailed monitoring plan																				
Activity 4.4 Undertake day-to-day monitoring of the overall project activities as well as periodic progress reviews and associated effectiveness evaluations.																				
Activity 4.5 Hold Project Steering Committee meetings at least once a year.																				
Activity 4.6 Draft and approve annual work-plans on planned project activities and outputs.																				
Activity 4.7 Prepare Annual Project Reports and Project Implementation Reports with																				

measurement of impact indicators																			
Activity 4.8 Carry out a project mid-term external evaluation (after 30 months of implementation).																			
Activity 4.9 Carry out a project final evaluation (at project completion).																			
Activity 4.10 Prepare Project Terminal report.																			
Output 4.2 Lessons learnt disseminated																			
Activity 4.11 Carry out dissemination of lessons-learned and experiences at national, regional and global level																			

ANNEX F: BUDGET

COMPONENT	Description	Year 1	Year 2	Year 3	Year 4	Year 5	Total	Execution Modality
		US\$	US\$	US\$	US\$	US\$	US\$	
Component 1: Policy and regulatory framework								
Outcome 1: Policy and regulatory framework strengthened and enhanced for the implementation of a sound management of metal recycling in compliance with the Stockholm Convention requirements.								
<i>Output 1.1: One (1) database capturing various aspects of the metal recycling chain, as a new tool for policy makers, compiled.</i>	International consultants	6000	6000	0	0	0	12000	UNIDO Technical Execution Support
	National Experts	18000	18000	0	0	0	36000	UNIDO Technical Execution Support
	Sundries	1000	1000	0	0	0	2000	Execution Agreement with national EA 1
	Project staff travel	5000	5000	0	0	0	10000	Execution Agreement with national EA
	Equipment/furniture	5000	2000	0	0	0	7000	Execution Agreement with national EA 1
	Workshops/training	0	0	0	0	0	0	Execution Agreement with national EA 1
	Subcontracts	0	0	0	0	0	0	
	Sub-total Output 1.1	35000	32000	0	0	0	67000	
<i>Output 1.2: Specific guidelines on environment, health and safety measures in the metal recycling chain value developed.</i>	International consultants	0	6000	3000	3000	3000	15000	UNIDO Technical Execution Support
	National Experts	0	12000	12000	12000	12000	48000	UNIDO Technical Execution Support
	Sundries	0	1000	1000	1000	1000	4000	Execution Agreement with national EA 1
	Project staff travel	0	2500	5000	5000	2500	15000	Execution Agreement with national EA 1
	Equipment/furniture	0	2000	2000	2000	0	6000	Execution Agreement with national EA 1
	Workshops/training	0	10000	0	0	0	10000	Execution Agreement with national EA 1
	Subcontracts	0	0	5000	10000	10000	25000	Execution Agreement with national EA 1
	Sub-total Output 1.2	0	33500	28000	33000	28500	123000	
<i>Output 1.3: Improved and harmonized national policies and regulations for environmental and health protection from metal recovery activities.</i>	International consultants	0	0	6000	6000	6000	18000	UNIDO Technical Execution Support
	National Experts	0	0	12000	12000	12000	36000	UNIDO Technical Execution Support
	Sundries	0	0	1000	1000	1000	3000	Execution Agreement with national EA 1
	Project staff travel	0	0	2000	2000	2000	6000	Execution Agreement with national EA 1
	Equipment/furniture	0	0	0	1000	1000	2000	Execution Agreement with national EA 1
	Workshops/training	0	0	0	0	10000	10000	Execution Agreement with

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								national EA 1
	Subcontracts	0	0	0	5000	5000	10000	Execution Agreement with national EA 1
	Sub-total Output 1.3	0	0	21000	27000	37000	85000	
Subtotal for Component 1		35000	65500	49000	60000	65500	275000	
Component 2. Information dissemination and capacity building								
Outcome 2.1: Increased awareness on U-POPs and BAT/BEP concepts by relevant stakeholders								
Outcome 2.2: Improved national capacity in the sound management of the recycling chain of scrap metal.								
<i>Output 2.1: Awareness raising materials and awareness raising workshops developed and implemented.</i>	International consultants	6000	6000	6000	3000	0	21000	UNIDO Technical Execution Support
	National Experts	22000	22000	22000	12000	0	78000	Execution Agreement with national EA 2
	Sundries	1000	1000	1000	1000	0	4000	Execution Agreement with national EA 2
	Project staff travel	2500	2500	2500	2500	0	10000	Execution Agreement with national EA 2
	Equipment/furniture	2000	1000	1000	1000	0	5000	Execution Agreement with national EA 2
	Workshops/training	20000	10000	10000	10000	0	50000	Execution Agreement with national EA 2
	Subcontracts	10000	10000	10000	15000	0	45000	Execution Agreement with national EA 2
	Sub-total Output 2.1	63500	52500	52500	44500	0	213000	
<i>Output 2.2: Technicians and operators of the scrap metal sector are trained on BAT/BEP.</i>	International consultants	12000	12000	12000	12000	3000	51000	UNIDO Technical Execution Support
	National Experts	30000	30000	30000	30000	12000	132000	Execution Agreement with national EA 2
	Sundries	1000	1000	1000	1000	1000	5000	Execution Agreement with national EA 2
	Project staff travel	5000	5000	5000	5000	5000	25000	Execution Agreement with national EA 2
	Equipment/furniture	2000	2000	0	0	0	4000	Execution Agreement with national EA 2
	Workshops/training	80000	20000	20000	10000	10000	140000	Execution Agreement with national EA 2
	Subcontracts	10000	10000	10000	10000	15000	55000	Execution Agreement with national EA 2
	Sub-total Output 2.2	140000	80000	78000	68000	46000	412000	
Subtotal for Component 2		203500	132500	130500	112500	46000	625000	
Component 3. Pilot project for the demonstration of BAT/BEP in selected metal recycling facilities.								
Outcome 3. State-of-the-art primary and secondary measures for U-POPs release reduction in selected facilities identified and deployed.								
<i>Output 3.1. BAT/BEP</i>	International	6000	6000	6000	6000	0	24000	UNIDO Technical Execution

<i>measures identified and implemented for scrap collectors and scrap consumers</i>	consultants							Support
	National Experts	24000	24000	24000	24000	6000	102000	UNIDO Technical Execution Support
	Sundries	1000	1000	1000	1000	1000	5000	UNIDO Technical Execution Support
	Project staff travel	6000	6000	6000	6000	2000	26000	UNIDO Technical Execution Support
	Equipment/furniture	2000	1100000	1100000	400000	0	2602000	UNIDO Technical Execution Support
	Workshops/training	0	0	0	0	0	0	UNIDO Technical Execution Support
	Subcontracts	50000	0	0	50000	0	100000	UNIDO Technical Execution Support
	Sub-total Output 3.1	89000	1137000	1137000	487000	9000	2859000	
<i>Output 3.2. Training of technical staff and other potentially interested local stakeholders (environmental authority, SMEs, scrap collectors, etc.) in the management of BAT/BEP undertaken</i>	International consultants	6000	6000	6000	6000	0	24000	UNIDO Technical Execution Support
	National Experts	24000	24000	24000	24000	0	96000	UNIDO Technical Execution Support
	Sundries	1000	1000	1000	1000	0	4000	UNIDO Technical Execution Support
	Project staff travel	5000	5000	5000	5000	0	20000	UNIDO Technical Execution Support
	Equipment/furniture	2000	2000	2000	2000	0	8000	UNIDO Technical Execution Support
	Workshops/training	10000	10000	10000	10000	0	40000	UNIDO Technical Execution Support
	Subcontracts	0	0	0	0	0	0	UNIDO Technical Execution Support
	Sub-total Output 3.2	48000	48000	48000	48000	0	192000	
<i>Output 3.3. Results of the implemented demonstration projects published and disseminated for replication through collaboration with existing financial institutions in the country.</i>	International consultants	0	0	0	3000	3000	6000	UNIDO Technical Execution Support
	National Experts	0	0	0	24000	24000	48000	UNIDO Technical Execution Support
	Sundries	0	0	0	1000	1000	2000	UNIDO Technical Execution Support
	Project staff travel	0	0	0	3000	3000	6000	UNIDO Technical Execution Support
	Equipment/furniture	0	0	0	2000	0	2000	UNIDO Technical Execution Support
	Workshops/training	0	0	0	0	0	0	UNIDO Technical Execution Support
	Subcontracts	0	0	0	15000	20000	35000	UNIDO Technical Execution Support
	Sub-total Output 3.3	0	0	0	48000	51000	99000	
Subtotal for Component 3	137000	1185000	1185000	583000	60000	3150000		

Component 4. Monitoring and evaluation; knowledge management and dissemination								
Outcome 4. Effective monitoring and evaluation of project impact and sustainability implemented.								
<i>Output 4.1. Project M&E designed and implemented.</i>	International consultants	3000	3000	33000	3000	43000	85000	UNIDO as Implementing Agency
	National Experts	6000	6000	6000	6000	6000	30000	UNIDO as Implementing Agency
	Sundries	1000	500	500	500	500	3000	UNIDO as Implementing Agency
	Project staff travel	4000	4000	4000	4000	4000	20000	UNIDO as Implementing Agency
	Equipment/furniture	1000	1000	0	0	0	2000	UNIDO as Implementing Agency
	Workshops/training	20000	5000	5000	5000	20000	55000	UNIDO as Implementing Agency
	Subcontracts	0	0	0	0	0	0	UNIDO as Implementing Agency
	Sub-total Output 4.1	35000	19500	48500	18500	73500	195000	
<i>Output 4.2 Lessons learnt disseminated</i>	International consultants	0	0	0	3000	3000	6000	UNIDO as Implementing Agency
	National Experts	0	0	0	6000	6000	12000	UNIDO as Implementing Agency
	Sundries	0	0	0	1000	1000	2000	UNIDO as Implementing Agency
	Project staff travel	0	0	0	2500	2500	5000	UNIDO as Implementing Agency
	Equipment/furniture	0	0	0	1000	1000	2000	UNIDO as Implementing Agency
	Workshops/training	0	0	0	0	0	0	UNIDO as Implementing Agency
	Subcontracts	0	0	0	14000	14000	28000	Execution Agreement with national EA 1
	Sub-total Output 4.2	0	0	0	27500	27500	55000	
Subtotal for Component 4	35000	19500	48500	46000	101000	250000		
Project total	410500	1402500	1413000	801500	272500	4300000		
<i>Project Management cost</i>	International consultants	0	0	0	0	0	0	
	National Experts	35000	35000	35000	35000	35000	175000	UNIDO Administrative Execution Support
	Sundries	1000	1000	1000	1000	1000	5000	UNIDO Administrative Execution Support
	Project staff travel	3000	3000	3000	3000	3000	15000	UNIDO Administrative Execution Support
	Equipment/furniture	4000	1000	0	0	0	5000	UNIDO Administrative Execution Support
	Workshops/training	0	0	0	0	0	0	
	Subcontracts	0	0	0	0	0	0	

	Sub-total for PM	43000	40000	39000	39000	39000	200000	
Project total including PM		453500	1442500	1452000	840500	311500	4500000	